FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

More Food—More Fish

OF recent years it has been suggested that fertilising methods similar to those used on the land might be applied to the sea to increase the productivity of fish food in the form of plankton and bottom fauna.

To test this, Loch Craiglin, Argyll, about 18 acres in area, was sealed off from the sea by a dam and sluice. An adjoining loch was left open.

In the spring of 1942, nitrate and phosphates were shovelled into Loch Craiglin from motor-boats. Thus the "slip stream" of the propellers assisted even distribution. The applications were made at monthly intervals and the total weight of fertilisers put into the loch were 600 lb. of nitrate of soda and 400 lb. of superphosphate. In the following year these quantities were doubled.

When the time arrived for a comparison between the "crops" of fish food in Loch Craiglin and its neighbour, it was found that the water in Loch Craiglin was considerably the richer in plankton and bottom fauna. In fact, it had become one of the richest areas known. Calculations made in August, 1943, showed that fauna useful as food for fish had increased by over 200 per cent. as compared with the previous summer. The effect on the fish was impressive. The fish population in the loch had increased and all well fed. The extra food produced allowed the fish to continue growing during the winter months. In normal conditions there is a cessation of growth in winter mainly due to relative scarcity of food, but under the changed conditions prevailing in the loch fish completed five or six years' growth in two years.

Wider Food Trade Between Nations

Dr. John D. Black, Professor of Economics at Chicago University, told the American Dietetics Association recently that the U.S. and other countries would improve diet and raise national purchasing power by "an increased post-war trade in food between nations."

He said: "In the post-war world a country with such rich resources as the U.S. could supply an adequate national diet without food imports or

exports, but not without serious losses. Increased international trade in food will improve diet and also national purchasing power throughout the world."

Professor Black said that such international food trade should be undertaken as a joint enterprise of food producers, distributors, and the Government, but that freedom of choice on the part of the individual consumers should be preserved. He added that the food producer must be assisted to adjust his production to the demands of consumption and to improve his methods. The food processing distributors could stimulate production and aid nutrition by paying for superior quality and by giving sound dietetic information to the consumer through advertising.

"The food and nutrition programme of the future should be carried out through existing agencies of federal, local, and state governments," Professor Black continued. "In addition, there should be created a national food and nutrition board to provide a place where the activities of all the agencies could be reviewed and studied together. The membership of this board should include heads of the divisions of government concerned with this problem, representatives of farm, labour, business, consumer and medical organisations, and representatives of the public who have a national reputation in the food and nutrition field. This national board should constitute a U.S. unity in the international food and agricultural organisation."

Food Production in Europe

We can trust it will soon be possible to estimate how rapidly the levels of food manufacture will be restored in the liberated countries. It is difficult to destroy grain in the granaries of sugar beet in stack, but it has been relatively simple for the Germans, where they had a chance, to put flour mills and sugar refineries out of commission.

As far as can be judged, the plants in France and Belgium have not suffered too severely, though the "bottle-necks" of transport made it impossible to process more than a fraction of the French beet crop during the season. The proportion was currently estimated at no more than 50 per cent.

Plainly, whatever be the success of the sowing and harvesting campaigns in the liberated territories, the feeding of the people will depend in part upon the availability of manufacturing and milling plant. Information has recently reached this country from Russia which may be taken perhaps as an indication of the speed of recovery where all energies, public and private, are harnessed to the great task of restoration. The Germans, it is stated, demolished in the aggregate thousands of food factories; but their rehabilitation was made a matter of high priority once the area had been liberated. So far, some 1,600 food factories have been reconditioned in a period of two years. Of these, about 100 are recorded as sugar mills, 26 as canneries, 80 as alcohol distilleries, 42 as vegetable oil mills, and 600 as bakeries. All the plants here included have reached pre-war levels of production.

The food bases serving these factories are, we are told, well assured. Four hundred farms especially attached to the food industries have been fully restored. It can be assumed that in most countries the extent of devastation has been of a somewhat lesser order, though the condition of the Netherlands is doubtless a serious one.

Heat Treatment of Ice Cream

Ice cream manufacturers who are in close touch with Government departments are strongly of opinion that at a not-too-distant date the first steps will be taken in official quarters towards the compulsory heat treatment of ice cream mixes. They believe that a lead will be given by the Ministry of Health in the matter as soon as an opportune time arises in the post-war period. The reason for any such move would be "the public health."

The fact is recognised throughout the trade that, from a bacteriological standpoint, ice cream manufactured from a heat-treated mix, whether a reconstituted product or one made from a hot-process ice cream powder, is usually better than one made by a cold process. The reason for this is that several of the ingredients used in ice cream manufacture are very susceptible to bacterial contamination. So great is the susceptibility that heat-treated mixes can very easily be recontaminated through the medium of unclean utensils and containers before the ice cream reaches the public. The fact that some of the ingredients of a cold mix may have been heat-treated during manufacture in no way prevents recontamination long before they reach the consumer in the final product.

From the standpoint of food value, the average cold-mix ice cream powder is well ahead of the hot-mix powder. Nevertheless, the main reason for the popularity of the cold-process mix powder is that it requires less trouble and less equipment to make it.

Although a statutory standard for ice cream is not likely to be introduced until ingredients can be obtained and used without restriction, discussions on the subject are expected to be opened by the Government departments concerned before the close of the present year. The standard with which the post-war trade will have to comply will be based on food value, and manufacturers declare that it is logical to expect that the Ministries of Food and Health will insist not only on nutritional value but also on bacteriological cleanliness.

Winter Milk Production

Speaking at a Press conference on April 11, Mr. R. S. Hudson, Minister of Agriculture, said that the output of milk in England and Wales during the winter of 1944-45 was 535 million gallons, compared with 461 million gallons in the winter of 1941-42, when the winter milk-production campaign was inaugurated. The increase of 74 million gallons is equal to 16 per cent., and the supply during the winter just closed was considerably greater than in any pre-war winter. The increase since 1941-42 (when supplies were falling below pre-war level) averaged 2·8 million gallons per week and nearly the whole of the increase had been absorbed by increasing claims of the priority classes.

Mr. J. L. Davies, Milk Production Officer to the Ministry and Assistant General Manager of the Milk Marketing Board, said that there had been an increase of about 40 per cent. in the winter consumption of liquid milk during the four years. In the winter of 1941-42 it was 449 million gallons and in the past winter 507 million gallons. The milk-production campaign would continue, he added, until the country was able to meet all liquid requirements without restriction.

It would seem from Mr. Davies's statement that milk manufacturers can have little hope of receiving any reasonably large quantities of milk for processing in winter until the liquid demand at that season of the year has been met.

One bright spot that emerged from the conference was a statement by Mr. Davies that dairy farmers are now showing great enthusiasm for better handling of cows and better methods of milk production. Milk manufacturers may therefore look forward to receiving supplies of higher average quality during the summer. The quality of milk for manufacturing purposes has, in fact, received a good deal of attention during recent months.

Advisory Committee on Kippering

Towards the end of last year the Minister of Food said that he was trying to improve the quality of kippers. One step was to consult the Torry Research Station and other authorities regarding a standard for kippers. The Minister came to the conclusion that the establishment of a statutory standard would be very difficult, so much depending on the practices adopted in individual kippering houses. It was therefore decided to set up a small committee composed of members of the industry to advise on technical matters connected with kippering.

Custard Powder

The Inter-Departmental Committee on Food Standards has had under review the question of an appropriate standard for custard powder with a view to the issue of an Order prescribing a standard under the Defence (Sale of Food) Regulations, 1943.

Before the war most, if not all, custard powders consisted of 100 per cent. starch with added colour, and with or without added flavour. The manufacture of custard powder is now controlled by the Starch Food Powders (Control) Order, 1944, which prohibits the manufacture of custard powder except in accordance with the terms of a licence granted by the Ministry of Food. At present it is a condition of such licences that custard powders must consist of:

Maize starch	75 per cent.
White wheat flour ...	20 per cent.
Rye flour	5 per cent.
Colouring)	A trace
Flavouring)	

The proportions of ingredients used to supplement the starch may vary from time to time according to the availability of suitable farinaceous diluents, and the licences are altered as may be found necessary. It is unlikely that the cereal diluents will include flours other than wheat or rye.

Information was given to the Committee that the larger manufacturers of custard powder are likely to revert to the pre-war composition as soon as possible; but as the price of starch is likely to be higher than that of flour there may be some inducement to retain the present composition of custard powder, or to use an even higher proportion of cereal diluents when the war-time regulations are removed.

The Committee suggest that if the Ministry of Food decide to issue a standard Order for custard powder, the standard should include a formula for the product, with a provision that if the nitrogen content exceed the specified limit it should rest with the defendant to prove that the formula had been followed. Any standard Order should also be drafted so as to exclude certain products which, though now defined as starch, contain substantial amounts of fibre and mineral matter which are not suitable for use in custard powders.

The Committee would view with regret the issue of an Order which would prevent or even deter manufacturers from improving the nutritional value of custard powder. Dried egg is not at present allocated for use in such powders, but there is no reason to suppose that the difficulties which have necessitated this ban will not eventually be overcome. Manufacturers might similarly desire to use dried milk or soya flour.

The final conclusion of the Committee is that no standard can be framed which would provide satisfactory control of the composition of custard powders as at present licensed without unduly restricting the choice of ingredients. In these circumstances they do not recommend any standard.

The committee will include the following members of the kippering trade: Messrs. G. N. Davidsen, W. J. Emmison, G. Marnoch, S. Nowell and J. E. Sampson. Mr. F. A. Bell will represent the Herring Industry Board on the committee. The Director of Fish Supplies (or in his absence another officer of the Ministry) will act as chairman.

The committee will advise on all technical matters relating to the quality and standards of kippers and to smoking premises and processes; on containers for kippers; on the movement of herrings for kippering; on the allocation of herrings for kippering; and on labour problems connected with kippering.

Nutrients in Wheat Endosperm

Recent work has added considerably to our knowledge of the distribution of nutrients, particularly the B vitamins, in the wheat grain. The scutellum portion of the germ is the main deposit of vitamin B_1, while the bran is rich in nicotinic acid and iron. T. Moran (*Nature*, **155**, 205 [1945]) describes some work which is part of a general investigation on the detailed chemistry of the wheat grain and the biophysics of flour milling. This has shown that the endosperm of wheat, far from being uniform in composition, has a graded and complex structure. It is bounded by the aleurone layer which is reputedly rich in protein and minerals. In normal milling, however, this aleurone layer, together with an appreciable amount of "starchy" endosperm, remains firmly attached to the bran. Moran describes an experiment in which a mixture of English wheats was milled in a laboratory plant to produce a short patent flour. The coarse bran was then freed as far as possible from adhering endosperm by four successive passages through a pair of fluted rolls. These four fractions (sieved finally through a 14 silk aperture, 0·095 mm.), together with the residual coarse-cleaned bran, were analysed.

Four points stand out from these results: (1) the outer endosperm is particularly rich in protein, iron, nicotinic acid and phosphorus; (2) the B_1 content, although much higher than in patent flour, is low compared with that in the scutellum, where it averages 60 I.U./g.; (3) the bulk of the phosphorus is in the form of phytate P (this incidentally is also true of germ and aleurone layer); (4) the total weight of endosperm included in the four fractions was approximately 2 per cent. of the weight of the wheat, corresponding to a thickness of about 12μ. Analyses showed that the coarse bran, after cleaning, still had its aleurone layer practically intact and contained, in addition, about 5 per cent. starchy endosperm (thickness approximately 3·5μ).

A Wit at Dinner

The centenary of Sydney Smith's death has been forgotten in days when lack of good food and leisure to eat it has suspended convivial meetings at the festive board. Yet "the Smith of Smiths," as brilliant conversationalist and most celebrated wit of his time, is worthy of commemoration, particularly by the gustatory world. Here was a man content, despite his gout, to "grow old merrily" and provide sparkling conversation as accompaniment to sparkling wine and good viands whether he was host or guest. "An excellent and well-arranged dinner is a most pleasing occurrence, and a great triumph of civilised life. It is not only the descending morsel and the enveloping sauce, but the rank, wit and beauty which surround the meats: the learned management of heat and light; the silent and rapid services of the attendants; the smiling and sedulous host, proffering gusts and relishes; the pleasant remarks; the handsome dresses; the cunning artifices in fruit and farina! The hour of dinner, in short, includes everything of sensual and intellectual gratification which a great nation glories in producing." So wrote Smith, and then added with typical antithesis: "In the midst of this, who knows that the kitchen chimney caught fire half an hour before dinner! And that a poor little wretch of six or seven years old was sent up in the midst of the flames to put it out."

As his social life gravitated to London when he became canon of St. Paul's, this uncommon man of common name moved his quarters from Amen Corner via Charles Street to Green Street close to Berkeley Square. His breakfast parties were fashionable affairs, with "muffins and metaphysics" and "crumpets and contradiction" well in evidence. He was a very welcome guest at many dinner-tables:

> Tory and Whig in turn shall be my host;
> I taste no politics in boiled and roast.

Yet his Somerset rectory continued to draw its distinguished visitors, especially since he saw to it that stomach as well as mind was looked to. "Our soups have the full appreciation of Luttrell; he declared himself last year perfectly satisfied with the fish department," was Smith's comment on his own kitchen which had pleased Henry Luttrell, wit and gourmet. "The artiste who is instructing our lady cook excels at culinary architecture. He has done Solomon's Temple in red sugar and Somerset House in chocolate." In Paris in 1835 his appreciation of good food was strong as ever: "I shall not easily forget a *matelote* at the Rochers de Cancale, an almond tart at Montreuil, or a *Poulet à la Tartare* at Grignons. These are impressions which no changes in future life can obliterate."

Perhaps his most striking point was scored where food is concerned with his idea of Heaven—viz., eating *pâté de foie gras* to the sound of trumpets!

British Beet Sugar

Part I

SPECIALLY CONTRIBUTED

FOR many years economists have preached the need of integrating agriculture and industry into a common purpose. Practical farmers and scientists alike agree that a fallow or cleaning crop is essential every fourth year or so if soil fertility is to be maintained at its highest level.

During its six months in the ground the sugar beet stores up energy and during its twenty-four hours in the factory the beet is separated into its useful parts—man gets sugar, animals receive pulp and molasses, the land attains fertility through the animal and is cleaned by the cultivation of the beet crop.

For small acreages of sugar beet the horse-drawn side-lifter is usually employed to loosen the beet. This operation takes place a day or so before the pulling and knocking.

Courtesy of British Sugar Beet Corporation, Ltd.

Sugar and War

During the 1914-18 war Great Britain learnt a solemn lesson. She realised that a country without its own sugar industry could be faced with sugar starvation; for then there had to be imported every ounce for a population using nearly 2,000,000 tons per annum. Four-fifths of this sugar was Continental beet sugar. The remainder came mainly from British sugar-producing colonies.

The Shaping of the Industry

From 1912 to 1925, experiments by pioneer beet growers, much propaganda by far-seeing politicians, and investigations by economists and financiers, all contributed to the foundations of the sugar beet industry of the present day. In 1925 the Beet Sugar Subsidy Act encouraged rapid development and guaranteed assistance for a ten-year period. By 1928 fifteen separate companies had erected eighteen factories sited to tap what was considered to be the most favourable sugar beet growing counties.

In the depression years of the early thirties the guaranteed market to some 40,000 growers, the demands of the factories for coal, limestone, bags and many other products gave employment and

All day long a stream of lorries pours into the unloading yards of the factory and great mounds of sugar beet are constantly replenished.

Courtesy of British Sugar Beet Corporation, Ltd.

security to countless men in town and country who otherwise would have swelled the ranks of the unemployed. It was later realised, however, that this State-aided industry could make its greatest contribution to the national economy if it were amalgamated on similar lines to a public utility corporation such as the London Transport Board or the Port of London Authority.

Accordingly, under the Sugar (Reorganisation) Bill, 1936, the original companies were amalgamated. The new organisation is known as British Sugar Corporation, Ltd., with a share capital of £5,000,000. The Corporation is limited as to profits and is controlled by a board whose appointment is subject to Treasury approval and whose chairman and two other directors are nominated by the Government.

The Sugar Commission created concurrently with British Sugar Corporation was of great service in advising on all matters relating to national sugar policy. On the outbreak of war its functions were taken over by the Sugar Division, Ministry of Food.

A Research and Education Committee was also set up, which included representatives of the Ministry of Agriculture, British Sugar Corporation, and the National Farmers' Union. Its funds are provided jointly by the factories and growers by means of a levy on beet processed.

World War II

Fully to appreciate the contribution this young industry has made during the past five years the following statistics will be helpful.

Firstly, the beet acreage was increased, reaching its peak figure in 1942, when 25 per cent. more sugar beet was grown than in any pre-war growing period. Expressed in acreage sown and tons of beet harvested the figures are:

	Acreage.	*Tons.*
1936-38 ..	—	2,741,000
1939 ..	345,000	3,529,000
1940 ..	329,000	3,176,000
1941 ..	351,000	3,226,000
1942 ..	425,000	3,924,000
1943 ..	417,000	3,760,000

Equivalent to 34 per cent. increase since 1936-38 by weight.

Normally, as has already been stated, the consumption of sugar in Great Britain is about 2,000,000 tons annually, or nearly 2 lb. per head per week. To-day this consumption has had to be cut by nearly 60 per cent., and just over 1 lb. per head per week is being consumed for domestic and manufacturing purposes.

The farmers of Great Britain and the factories they supply have produced the equivalent of the whole of the domestic wartime ration of 8 oz. per head per week. In terms of shipping released for other essential munitions of war, this is a notable contribution.

Nor is this the whole story. A sugar beet crop of some 400,000 acres produces approximately 3,000,000 tons of leaves and crowns for cattle food as well as 300,000 tons of dried beet pulp, equivalent in stock feeding value to a similar weight of oats. In addition, 144,000 tons of molasses remain as a valuable by-product of sugar refining.

Those in the home-grown sugar industry rightly claim that their contribution to the war effort is not the least; without this home supply our present sugar ration would undoubtedly be even less than it is.

The Sugar Beet Crop and the Farmer

It would be fair to say that farmers have come to appreciate beet as a crop which not only pays a cash income but which offers subsidiary advantages such as a return of beet pulp from the factory, plus the tops and crowns which he retains and which serve him as feeding stuff, in place of the turnip crop which beet has now largely replaced. It has also been established that beet is more beneficial to the soil than other roots, and in Eastern England especially beet has become the pivot on which the farm policy revolves. It has not competed with potatoes as a cash crop, but has largely taken the place of turnips and mangolds in the rotation.

Safeguarding the Seed Supply

Just before the beginning of this war the minds of the officers of the Company were exercised over the possibility that seed sources on the Continent, from whence came 60 per cent. of the supplies, might be lost, and it was appreciated that breeding and selection could not be built up overnight.

Arrangements were made for reserve stocks of mother seed to be stored in the country. In 1939-40, when conditions were developing to make the situation more difficult, additional supplies of commercial seed were obtained from Holland. This provided the necessary time for the British seed producers to increase production from the stocks of mother seed on hand, and thanks to their efforts and subsequent selection and breeding work the entire beet crop is now grown with British seed.

Research and Education

The production of the beet crop is itself a process calling for skill and care, and a vast amount of research and experimental work is being done by factory agricultural staffs, farmers and research institutes under the general control of the Sugar Beet Research and Education Committee appointed by the Ministry of Agriculture, upon which farmers and factories are equally represented. Special attention is now being devoted to mechani-

This simple but ingenious device is known as the Elfe machine. It washes beet directly off the lorry into a well, from which it is drawn into the factory.

Courtesy of British Sugar Beet Corporation, Ltd.

sation, particularly in the harvesting of the roots, but, thanks to the normal weather conditions in Great Britain, the harvesting of the crop can be spread over a longer period than in most beet-growing countries, and processing generally extends from the beginning of October until the end of January.

While all factories are experimenting at this time on the best method of clamping beet on farms, the past two seasons have been too mild to permit any definite decision being made. So far, large clamps have proved most successful, but it is not known whether covering aids the keeping qualities or not. What is definite is that beet left exposed in or out of the ground in any weather lose value and quality. For this reason deliveries have to be organised over the average thirteen-week factory season, and lifting synchronised so that deliveries are made as and when the factory requires them.

A simple yet effective system of control has been devised to ensure this. Deliveries come by road, rail, and water in counties where canal systems encourage this method. Deliveries by all three methods permit motor loads by day and rail and barge loads by night, and it might be fairly claimed that a new transport sphere has developed coincidentally with the beet industry. Central control by a system of permits ensures the co-ordination of deliveries.

(*To be continued*)

Barley and Oats as Food Grains

It has been suggested by good authorities that barley is the oldest of all cultivated cereal crops. At one time it undoubtedly was an important part of the diet of people in Southern Europe, but like oats, it has been used as a grain for livestock. A percentage of barley goes into the production of malt products, and some is consumed as human food. But it is also considered excellent for livestock as well as for human beings. Its use in Canada has greatly expanded with the growing hog population of the war period to meet British requirements.

Barley was a most important cereal crop in Ontario in the latter part of the nineteenth century, when large exports went to the United States. In 1889-90 the Americans imported about 10,000,000 bushels of this Canadian product, and the bulk of it from the Province of Ontario. The trade suffered when in 1890 the tariff on barley entering the United States was increased from 10 to 30 cents a bushel.

Since then Western Canada has enlarged its production, and tariffs on barley entering the United States from Canada have been considerably modified. The duty was reduced in 1913 to 15 cents; in 1922 it was raised to 20 cents, at which it remained until again reduced to 15 cents in 1939 under the Canada-United States Trade Agreement. As a result, exports on a liberal scale have again been possible. The movement of Canadian barley to the United States has however been somewhat erratic the past twenty years, although in 1942-43 and 1943-44 the United States has purchased heavily from Canada—in fact, provided the most important outlet for surplus—the lack of shipping preventing exports to the United Kingdom and other former markets where barley is wanted.

The production of suitable malting types for the United Kingdom market was closely studied between the two wars, and prior to this war Canadian barley was purchased in large quantities by Scottish distillers, and for livestock. The peak was reached in 1928-29, when Canadian exports of wheat also went up to the highest total. But exports receded sharply the next ten years, and did not again approach the pre-depression totals until the United States began to buy heavily in the crop years 1942-43 and 1943-44.

International trade in barley before the 1930 slump was in the neighbourhood of 175,000,000 bushels annually, and up to 1929 British North America enjoyed a good share of this movement. The chief competitors were Rumania, the United States, Argentina and Poland, while Russia occasionally came on the market and was a big exporter in the calendar year 1930. Trade figures show that Germany was the largest importer of barley in those years, although some of the shipments credited to that country may have been in transit to other countries. The Netherlands also imported considerable quantities and, with Belgium and Germany, ranked high in the list of continental European importers. The United Kingdom imported roughly 20 per cent. of the total international trade in barley in those pre-war years of extensive shipments.

Barley has presented no surplus problem in Canada during the war years 1939-44, largely due to the great

increase taking place in livestock and to the ready and near markets in the United States for surplus stocks held in Canada. It was actually found necessary early in 1944 to put a ban on the export of barley until commercial supplies from the 1944 harvest assured sufficient for the domestic market.

As for oats for human food, history does not record whether the Scots first discovered the virtues of that cereal, but it does reveal that Caledonia's nationals consume oatmeal in very generous quantities, although man, Scot or otherwise, has taken second place to the animal population in the eating of oats. As a standard grain for horses the cereal has been grown in many lands; but in Canada its use, mixed with other grains, has increased greatly as food for cattle, hogs and poultry, even though in Scotland it is oatmeal porridge that has made the cultivation of the grain a national and popular industry.

As far back as 1868 nearly 2,000,000 bushels of oats were exported from Canada, chiefly to the United Kingdom. About thirty years later the export movement to all countries had increased fivefold, the total exceeding 10,000,000 bushels in 1899. It was, however, during the first World War that exports of Canadian oats really surged upwards, reaching 62,000,000 bushels in the crop year 1915-16 and more than 64,000,000 in 1916-17. Then shipments went down to 28,000,000 bushels in 1917-18, which was about the average for the following nine years. Then lean years in the export field, continuing until World War II provided export outlets to the United States.

World competition in the export of oats is not, of course, comparable to that in wheat, despite enormous production of the grain in European countries and in the Western Hemisphere. The United Kingdom usually was the largest importer, while Switzerland, the Netherlands, Belgium and Italy were next, with Denmark and France occasional importers. The principal pre-war exporters were Russia, Germany, Rumania, Czechoslovakia, Argentina, Chile, the United States and Canada. Their combined exports, however, were only a small part of the total produced, the balance being retained for domestic purposes.

When prices are relatively high, more oats move from farms into commercial channels; but Canadian records show that even in years of high exports these are but a small fraction of the total grown. During six years, 1920-21 to 1925-26, for instance, when exports averaged more than 25,000,000 bushels annually, this was less than 3 per cent. of the annual output during the same time.

Institutional Cooking and Ascorbic Acid

A FEW years ago there were published the results of Vanstone and Knapman, of the Seale-Hayne College in Devonshire, whereby a remarkable nutritive value was ascribed to Roscoff broccoli—the cauliflower-like variety. These authors did not consider vitamin values, but they showed that on account of the richness of this broccoli in minerals the vegetable could fairly be compared, on a dry-matter basis, with dried skim milk; so that if fat is added during cooking an apparently balanced meal results from a single dish.

Testimony to the nutritional qualities of broccoli now comes from a very different source—Arizona, as a result of investigation of the vitamin C values of vegetables after institutional preparation for consumption by large groups of soldiers. As the authors say: "Very little is known of the extent of vitamin losses in *large-quantity* cooking processes," and their analyses of cooked vegetables were made upon samples taken after actual large-scale cooking.[1] They also point out (unconsciously reinforcing some propaganda of our Ministry of Food): "Many fresh raw vegetables are much richer in ascorbic acid content than citrus fruits and tomatoes which are more generally recognised as the best sources of this vitamin for meeting the human requirement."

Nine principal vegetables were included in the survey, but we may omit consideration of several which are unobtainable in this country and which in any case had a low ascorbic-acid content. The attached table summarises the average findings relating to the others; the superiority of broccoli is evident. The broccoli of these investigations was apparently the sprouting variety. A difference in the mode of cooking may account for the larger loss in broccoli during cooking.

	Ascorbic Acid, Milligrams per 100 grams in		*Percentage Loss during Cooking.*
	Raw.	*Cooked.*	
Broccoli ...	114	59	48
Cauliflower ...	76	47	38
Green cabbage	50	31	37
Spinach ...	53	22	59
Potatoes ("Irish")*	15	2-10	varied greatly with mode of cooking
Lettuce (fresh)	3·2 (whole)	2·8 (after cutting and standing)	—

* "Irish" potatoes are ordinary potatoes as distinguished from sweet potatoes.

Carrots were not included in this survey, as it was known that they were poor sources of vitamin C, but another publication in the same series[2] reports a fairly extensive study of vitamins in carrots of two varieties and at several stages of growth. No substantial difference due to variety was found. The percentage of carotene increased with size; the amount of carotene in carrots ranged from 2 to 20 mg. (3,300-33,000 I.U.) per 100 g. The thiamin content of all the carrots analysed fell within the range 0·04-0·07 mg. per 100 g. The ascorbic acid content of carrots of marketable size ranged only from about 3-6 mg. per 100 g., but very young carrots of "pencil" size had 5-8 mg. per 100 g. No vitamin determinations of cooked carrots were made.

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[1] Margaret C. Smith and others of the Department of Human Nutrition, with Mary A. Wood, Director of Dining Halls: *University of Arizona Agricultural Experiment Station Mimeographed Report* 59, 1944, 17 pp.

[2] Margaret C. Smith, Emily Caldwell and Louise O. Burlinson, *ibid.*, 66, 1944, 9 pp.

The Food Controls of the Future

Part II

SPECIALLY CONTRIBUTED

Post-War Conditions—Monopolist Tendencies

(Continued)

IT IS usually supposed that, in a time of plentiful food supplies, a rise in prices will be checked by the play of competitive interests in the market. Will this guarantee be sufficient? We may doubt it. It is impossible to predict in what precise form the food trades will emerge from the war; only when their structure has become visible shall we be in a position to estimate how far the impact of war upon our economy has affected them. But we can conjecture that in the sphere of primary production we shall see the development of marketing boards of a very inclusive character, possessed of strong bargaining powers and encroaching upon the fields of processing and distribution. We may assume, too, that some of the trading and importing associations that have come into existence in the course of the war are likely to survive it; the advantages of centralised purchasing are obvious enough to check their disintegration. Such associations have been so devised as to retain in being a number of firms that might otherwise have disappeared, but their subsequent absorption by their more influential competitors seems highly probable, especially if we may judge from our last post-war experience.

Growth of Concentration

In other branches of the industry there are certain signs of the growth of concentration. In the retail trades, for example, we can observe a tendency to demand the licensing of new shops, and this tendency, if carried far enough, would lead to the practice known as "restraint of trade." There are, of course, in the complex world of retail trade many influences at work persuading the shopkeeper or the potential shopkeeper against any such practices; yet the tendency is evident and could, unless measures are taken to protect the consumer, begin to affect one area or another. Both the multiple shops and the co-operatives appear to be preparing themselves for fresh expansion; and this alone would restrict the scope of competition in the retail market, even if we assume that competition will be maintained between the protagonists themselves.

The problem of the resistance on the part of trade associations and of virtual monopolies to a systematic reduction of food prices will have to be faced. We have to inquire whether it is intended to introduce legislation against restraint of trade and the adoption of monopolist practices by large industries and associations. "There has in recent years," states the White Paper on Employment (Para. 54), "been a growing tendency towards combines and towards agreements, both national and international, by which manufacturers have sought to control prices and output, to divide markets and to fix conditions of sale. Such agreements or combines do not necessarily operate against the public interest, but the power to do so is there. The Government will therefore seek power to inform themselves of the extent and effect of restrictive agreements and of the activities of combines; and to take appropriate action to check practices which may bring advantages to sectional producing interests but work to the detriment of the country as a whole." If the Government has this intention, its measures may go some way to protect the consumer. But it must be admitted that, from the point of view of an economist, the prospect of devising effective legislation for this purpose is not very good.

Production and Distribution

How, then, shall it be achieved? We cannot here discuss the whole question of the relation of competition to low consumer prices, but it must be commented that the problem of collusion between the various stages of production and distribution is now becoming of even greater significance to us than is the problem of collusion between a number of producers or a number of wholesalers for the purpose of maintaining a high level of prices. The guarantee to the consumer that he will obtain cheap food depends in no small measure upon the relative ignorance of producers about the wholesaling and manufacturing position, of wholesalers about the retail position, and of retailers about the manufacturing position. Where we find a vertical development of producers' organisations into the sphere of processing or a similar development of manufacturing interests into the spheres both of primary production and of retail trade, this barrier between the various parts of the industry tends to break down. Moreover, the large associations of producers or retailers, as they develop, usually create their own research departments and undertake to supply market intelligence to their members. The various sections of the industry may, in fact, unless they are prevented from doing so, enter into agreements for the purpose of maintaining prices, limiting output, restraining fresh

entrants from access to the market, and in other ways affecting the ultimate price the consumer has to pay.

To restore in commerce the elements of nineteenth-century competition seems beyond the wit of legislation alone. Something further will be required, and that is that the State must arm itself with certain reserve powers of intervention in the food market and apply those powers wherever the operations of manufacture or trade are tending to restrict production and raise prices. The State may, if it wishes, assume that the food trades fall contentedly into line with this policy, and if they do so it will mean that they embark on a programme of high output with relatively low returns per unit. The State can here assist, both by setting up commissions of inquiry into fields where a lowering of costs seems practicable and by making cheap money available for reorganisation.

Reserve Powers of the State

But the reserve powers of the State to act on behalf of the consumer would still be needed. There is no guarantee that all the trades affected will agree to play the game at all times and in respect of all commodities. The reserve powers would have to amount to the readiness of the State to resume, from time to time, a measure of full control. It would do so on the grounds that a shortage had occurred in some foodstuff in general demand, induced not by a war but by the operations of trade. Experience seems to show that, where the existence of a shortage has become common knowledge, it may be necessary to fix prices and profit margins temporarily at every stage in the process; the price rise otherwise only shifts from one stage to another. Obviously the less inclusive the control the better for all concerned.

In effect, a Ministry, which was the State's instrument for regulating food price levels, would find itself, we may trust, working in harmony with certain trade or producing interests, and a kind of fluid partnership would be established. Such sections of the industry as were prepared to adopt a policy of high production levels and low prices per unit would have little to fear from any measures the Government thought fit to take towards a lowering of the costs of transport and distribution. With the machinery through which the State would possess itself of these reserve powers of control we shall have to deal in a subsequent page. But unless it establishes such machinery and uses it with conviction, the control of our food supplies will pass out of the hands of the State only to pass into those of a heterogeneous assembly of marketing boards, combines and trade associations.

Post-War Conditions—Industrial Reorganisation

It is not desirable here to attempt a forecast of the various types of industrial reorganisation that may, in the post-war years, affect one commodity or another, but a few general principles can be laid down. Where one of the major food trades seems prepared for reorganisation and such reorganisation is in the public interest, it is, of course, right that the Government should take the necessary steps. The safest method, it is now agreed, is for a council to be established for the whole industry with a majority of nominated members. But if a Ministry of Food is retained after the war, there seems no reason for establishing such a council outside the walls of the Ministry; and it may be assumed that the Minister would both nominate the majority of its members and himself preside over it. The method would be no less flexible for being thus related to a single Department.

Any producers' or distributors' boards that then emerged would have to fit into the structure of the council and ultimately into the structure of the reorganised industry. There is little risk to the consumer from the existence of sectional boards of this kind, if they have no power to enter into collusion to stabilise high prices. So long as decision rests with an independent council or with a Minister, who must be in possession of all the relevant statistical material, the consumer's position is tolerably secure. It is not, however, suggested that all the industries are ripe for such reorganisation or should be moulded to a common pattern. Decision on that matter will have to be left to the Government's tactical plan; and no more can be done than to indicate the general form the process of reorganisation should take.

When reorganisation takes place, the important thing for the Government is that the industry shall not be stabilised on the basis of a large number of high cost or marginal producers or retailers. In war-time this has been inevitable, because prices have had to be so established as to cover such marginal men. There was no source of supplies upon which the Ministry of Food could draw to make up for a temporary deficit due to a fall in production. The unavoidable rise in prices could be met by Exchequer subsidies. But in time of peace the decision on prices has to be made in such a way as to advance the efficient and low-price producer or distributor, while ensuring the continual flow of supplies on the market. No other method is possible for a Government that seriously desires to effect a continual lowering of the costs of production, wholesaling and transport, so that the final consumer price may be reasonable.

It is evident that in the early post-war years there will arise from the home producers a demand for a system of guaranteed prices. A number of farm commodities will be concerned; and it seems likely that there will even be a demand for a price mechanism that can deal with the "global prices" of all farm produce and not merely with the separate products. For, as is known, prices on the farm are related both to one another and to the cost of

seeds, fodder, fertilisers and so on. At present the Minister of Food is the ultimate authority responsible, in consultation with the Minister of Agriculture, for fixing the level of farm prices.

But it must be realised that, if the Minister does not intend to perform this function in the post-war world, his place will be taken by a series of producers' marketing boards, which may later merge, in fact if not in law, into a single board. Such boards would doubtless tend to stabilise commodity prices at an unnecessarily high level and to deprive the consumer of any benefit he might have received either from a seasonal rise in production or from a permanent fall in production costs. At this stage the Government might be compelled to intervene in a hurry; and its only refuge from this undignified course is, as far as can be seen, that of anticipating any steps the farmers might take by itself establishing councils to decide upon the price structure of the industry. But a partly nominated council would be immeasurably strengthened if it had a Minister answerable for it to Parliament.

Guaranteed Farm Prices

As has been already implied, any council that attempts to fix guaranteed farm prices can only do so if it is also making some effort to encourage the low-cost and efficient producer. Only the necessity of war would excuse it from this task. The farmers may assure us that their own marketing boards are prepared to encourage efficient and low-cost production among their members; no doubt they are, but they would be well advised to hand over the function to an independent tribunal. The process of using the price mechanism alone to direct production into new channels is a slow and difficult one. It needs a long-term view; and it is doubtful whether it can be effective alone without the exercise of some legal compulsion upon the producers.

How far the home farmer is to be assisted in our post-war world is a matter for our commercial policy. But it may be noted that, if he is to be assisted, he will presumably have to give something in exchange in an agreement both to improve his methods of cultivation and to accept some direction from his own committees as to what he is to produce. This aspect of the problem has to be mentioned in passing; but beyond that we are not concerned with it. The more immediate point is that someone will sooner or later be called upon to guarantee producers' prices; and the Ministry of Food now does this effectively, in consultation with the Ministry of Agriculture, simply because the Ministry of Food takes over most farm commodities at the moment they pass from the farm into the first stages of processing or grading. If we could contrive some method whereby a peace-time Ministry could perform the same function without actually acquiring the foodstuffs by purchase, we should be on the way to solving a mass of complex problems.

Let us, then, fix our attention upon this point where the foodstuffs pass from the farms into the first stages of processing or grading, and upon the point where foodstuffs from overseas reach our warehouses. For it is somewhere about this point that the operations of the present Ministry of Food begin; and it is through the Ministry's estimate of consumption levels that it is able to negotiate guaranteed farm prices either with the home producers or, on behalf of the overseas producers, with their own Governments. It is from this basis that the Ministry negotiates upon all price-levels that affect the passage of the food through the manufacturing, wholesaling and retailing stages to the final consumer. Wherever the sections of an industry have to be reorganised, the problem of prices and costs will certainly arise; and, if the whole problem of farm prices has to be dealt with, it is where the food enters the sphere of the present Ministry that the decision is primarily made. Can we then devise some simple method of handling the problem without at the same time imposing upon the market a rigid and permanent control?

Post-War Conditions—International Agreements

The least certain aspect of our post-war food situation is the relation between home and overseas supplies. It may be, of course, taken for granted that no Department that has to handle this side of the business can do other than reflect Government policy. But the present Ministry of Food does perform one important function. It takes into account the actual dietetic needs of the population in suggesting to the Government what foodstuffs shall be imported and what shall be produced at home. Now, it is true that the policy embodied in the resolutions of the Hot Springs Conference favours the establishment of free trading relations in foodstuffs; and if a number of countries embark on a high consumption policy, the position of the home farmers in any one of them is the less likely to be threatened by such free movement of foods across national frontiers. But agreement between a number of countries is necessary; and in the meantime a country like our own might have recourse to a series of bilateral arrangements affecting both the countries who may be expected to take our exports and those from whom we have to receive food and raw materials.

Since foodstuffs are commodities, the Government's fiscal policy will tend to be based not purely on dietetic considerations but on an elaborate estimate of the kind of foodstuffs produced in the favoured countries and on the apportionment of our annual imports between food, raw materials and manufactured goods. In that case we might for an indefinite period of time be subject to a system of shifting quotas and even to the virtual exclusion from our market of certain imported foods.

The Government would thus have to define its home production policy in the light of the export

position, of its international commitments and of the world situation in general. A reconstructed Ministry of Food, if it came into existence, would have to estimate the level of its demands upon the home farmer not on the basis of the available shipping but on the basis of the Government's import policy. It is obvious that in that case the home farmer, too, would have to adapt his production to meet in some measure the impact of world prices; and there is little doubt that he is well able to do so, if he is given sufficient encouragement. But encouragement will have to be systematically applied; and it will not be possible to dispense with any instrument that could act as a lever on production, whether it be low interest bearing capital, the offer of guaranteed prices or the use of judicious subsidies.

The Use of Subsidies

The undisguised use of subsidies is probably the safest method of dealing with the relation between home and overseas supplies. There is nothing unorthodox about subsidies, whether they be applied to the encouragement of output or to the reduction of the price the consumer has to pay. The extent to which they can be adopted depends entirely upon the patience of the taxpayer. They are preferable to any attempt to establish pool prices as between imported and home-grown foods, since the principle of the pool price might be viewed with disfavour among our overseas competitors and it is, in any case, an appeal to a very uncertain instrument. The farm subsidy is, by comparison, an instrument that can be nicely adjusted to the need; and it can and, of course, should be used in association with a policy of encouraging the low-cost and efficient producer.

The extent to which any one home-produced food would have to be subsidised cannot be predicted; it would depend on the extent to which it is dietetically indispensable and so must at all costs be obtained. But there is at least one commodity of which we may say that we shall probably have to subsidise it for an indefinite period of time, and that commodity is milk. Milk is becoming a necessity of life; and we might argue strongly that it should be given differential treatment. If the schemes for special milk provision are to be maintained and expanded, we shall have to keep up the level of milk production; and, until we have increased it considerably, we shall have still to ration the general consumer. Yet it seems improbable that milk production can be made sufficiently attractive or the costs of production reduced, except on a very long-term programme.

One thing, however, is clear. If we are committed to a policy of high employment and low food prices, we shall experience a steady demand for such quality foods as milk and milk products, meat and eggs. It is here that the pressure of the overseas market may be most intense; and it is here that we shall need to improve our own methods of production, transport and distribution. There will be a public demand for these foods; and naturally the importing firms that have established or might establish connections with overseas producers would prefer to exploit them to the full without Government interference. It is, of course, desirable that the Government should interfere as little as possible with such overseas connections. If a quota has, for example, to be imposed, it is essential that the supplies that are permitted to enter the country shall not be allocated among the wholesalers and manufacturers upon some datum line principle, having reference to their previous transactions; such a practice invariably tends to sterilise competition and to petrify the market. Some allocation would have to take place; but unless the Government acquired the whole supply it could not solve the problem by selling again to the highest bidder. Its only alternative would seem to be that of establishing a kind of clearing-house, where the existing commitments of traders to overseas producers could be assessed and allocations adjusted with the minimum disturbance of the overseas market. The problem is a difficult one, especially if there persists for some time, as it is reasonable to suspect there will persist, a quantitative restriction on the import of many types of foodstuff.

The complexity of the post-war food situation unquestionably demands a Department that is responsible for the dietetic welfare of the public, since it is on the basis of this responsibility that the Government will ultimately have to adjust the levels of home and overseas supplies. The strain may be imposed mainly upon our home farms, because the course of our import policy cannot be accurately predicted; and in that case we shall need a sensitive mechanism to attract from our farms the kinds of food we shall require. On the flexibility of the mechanism and the completeness of the statistical material will depend our success in handling the situation.

Summary of Proposals

This, then, is the kind of world for which we have to prescribe. Let us return to our original question. How far is it desirable for the State to intervene in the sphere of food manufacture and distribution? We can only indicate certain key positions that the State might assume, since it must be free to develop its strategy according to the experience it gains.

There are certain features of our present control system that are worthy of attention, because they suggest the manner in which the Ministry could be reconstructed for the purposes of peace. Control means that all supplies of essential foods pass, on their journey to the consumer, through definite

filters, or what we might call "bottle-necks," established at certain convenient points. At these points of concentration the Ministry fixes its controls, there it acquires in some way the whole supply, subjects it to inspection and adjusts allocations and prices. These "control points" are physically embodied in warehouses, cold storage and processing plants, abattoirs, testing and packing stations and the like; and in theory there is no foodstuff for which its appropriate form of concentration could not be devised. Since this mode of distribution will be dealt with here, the term "bottle-necks" will be used to describe the filter system which is referred to. The reader will understand that the term has here no restrictive meaning, but merely implies that the supplies flow through a narrow channel at one point before they are dispersed into the market.

Maintenance of "Bottle-necks"

The maintenance and extension of this system of "bottle-necks" would permit the State to assume control over food supplies should the post-war situation make this at any time advisable. It would further allow all the statistical information required to be collected without an undue intrusion upon the commercial activities of manufacturers and distributors. The importance to the State of possessing statistical control over the supply position we have already mentioned. It is difficult to see how the State is to intervene with any hope of success, unless it has all the facts at its disposal. But while information on supplies and, to some degree, on the costs of manufacture and distribution must be available, it is not necessary to assume that the statistics required will have to be in excess of the type of statistics referred to in the White Paper on Employment. How far they will also need to be held as confidential is another matter; on that Parliament would have to decide, though the existence of confidential Government statistics in time of peace is an anomaly.

But it is not suggested that the State should retain this system of "bottle-necks" in order to acquire the foodstuffs or even, in any physical sense, to control them. It should retain, extend and refine the whole system in order to establish inspection over the *quality* of all the essential foods marketed. The "bottle-necks" should apply both to home-produced and imported foods; and it must be pointed out that the depots, warehouses, packing stations and so forth, in which they are embodied, need not be under State control or even under State management; they might be licensed points of assembly under the management of private firms, co-operatives or local authorities.

The scheme is necessary not only for the inspection of quality but for the encouragement of grading, packing, cleanliness and the utilisation of by-products. To this end the State would have to possess powers both of inspection and for the issue of regulations on storage, sanitation, labour conditions and the like. Beyond this it need not venture, except so far as it has been granted certain reserve powers of assuming fuller control should the situation warrant.

It is obvious that the practice of licensing such "bottle-necks" would involve a number of problems; these will be dealt with later. For the moment it will suffice to repeat the proposition that the "bottle-neck" principle in distribution should be retained after the war, whatever else of the Ministry's present structure we decide to liquidate.

The next main proposal to be made is that the State should acquire and hold stocks of certain varieties of food in a preservable form, either through its own agents or through the medium of licensed firms and local authorities. This proposal is intended for the solution of a complex group of problems; and to it should be added the proposal for the regular bulk purchase of perishable foods in limited quantities from the home supplies.

The purchase and disposal of these foods would be made in respect of (*a*) the provision of selected foods to special categories of consumers, and (*b*) the supply to social feeding establishments, school canteens, institutions and so forth.

The objects of the proposal may be briefly summarised thus: (*a*) The State would be enabled to guarantee to producers, both at home and overseas, that limited surpluses of food could be removed from the normal market and so be prevented from depressing prices against the producers. (*b*) The surplus produce could be disposed of through the large network of canteens and institutions that would gradually be incorporated into the scheme. This implies that they would have to adapt their catering in some degree to the types of foodstuffs that have shown a surplus from time to time; but such adjustments are relatively easy for institutions, provided they are aware what varieties of food they may be expected to handle.

Since this scheme would be integrated with the plan for the holding of "buffer stocks" of wheat and possibly sugar and other commodities, the State would have a further advantage. It would have the power to take over the stocks at any moment should the need arise; it is guaranteed against the risk of short supplies and against disturbance in the international markets.

It would, of course, be necessary for a large proportion of the school canteens, works canteens and institutions in the country to be gradually organised into a kind of corporation which would, in effect, function as a special market. Indeed, if the Ministry of Food persists, it might be well advised to establish under its auspices such a corporation, representing the various organisations and institutions concerned. But the Government would have to indicate to this corporation what foodstuffs were

from time to time deemed to be "surplus." The scheme is thus that of segregating a small part of the market and keeping it insulated, in order that it may deal with the bulk storage of some foods and the bulk purchase and disposal of surplus produce. Normally the two markets would never meet and there would be no risk of the stocks held by the corporation overshadowing the free market. Only where the State used its reserve powers of controlling stocks in an emergency would the two markets fuse.

It is realised that even this slight degree of State intervention may be looked upon with suspicion in some quarters. But the proposals here set forward have precedent either in our own country or in a country that possesses, as in the case of the U.S.A., an economic structure similar to our own. They all fall within the ambit of orthodox economic procedure. No doubt the occasions on which the State could use its reserve powers of control and coercion would have to be precisely defined; but with the details of that we are not here concerned; they must be left to the process of public debate. What is suggested is that the machinery here outlined would be basically sufficient for our purpose; by means of it we could handle all the problems of a peace-time economy, provided we used it as a tactical device and not merely as a static form of administration.

The third and last instalment of this series of articles will be published in the next issue.

Correspondence

ALTERNATIVES TO PASTEURISATION

In the March issue of FOOD MANUFACTURE* *Dr. J. G. Davis commented on articles by Mr. Edward P. Smith, M.P., and Mr. A. P. Newall on the carbonation and deep-freezing of milk.† We print below the authors' replies to Dr. Davis on the subject.*

Mr. A. P. Newall writes:

The French have a most useful saying, *chacun à son goût*, and I do not think that Dr. J. G. Davis would seriously dispute that Mr. George Bernard Shaw is not entitled to say that he dislikes the taste of pasteurised milk, nor is there anything either very wicked or wrong in his giving public expression to this opinion. I think Dr. Davis must also have noticed that he made the same reference to boiled or distilled water, and most of us would be quite prepared to agree about that whatever our views on the subject of the taste of pasteurised milk might happen to be. Anyhow, I have met in my time so many people who have expressed the utmost dislike for the taste of pasteurised milk and, as I have shared it myself for a long time, I can hardly be expected to disagree with Bernard Shaw's dictum. I think, however, that that is not a very material contribution to the subject on which Dr. Davis challenges myself. He evidently regards me as a person who has discovered something, but that is very far from being the case, and, indeed, I must have expressed myself most inadequately if I conveyed it to him. I think the utmost that could be said of my views on this matter is as I suggested—that there were possibilities in deep-freezing milk, in order to overcome the many problems that are associated with its bacterial content. I do not wish to appear to be pressing the point of this method of getting rid of pathogens, but I still think that I am justified in suggesting that it might possibly prove to be a method that had merited investigation.

As I said at the time, I have been carrying out experiments in the deep-freezing of steel, but since I wrote that article I have gone long beyond the experimental stage. In my works a very considerable tonnage of steel has been deep-freezed with extraordinary results—that is to say, it has been proved beyond a peradventure that when certain types of steel are subjected to a temperature of minus 120° F. they become possessed of properties which give them a very greatly increased life, in most cases not less than 100 per cent., but sometimes even several hundreds per cent. This is all a new development in this country, and, of course, it is in its early stages, and it might be rightly considered as having nothing whatever to do with the subject of milk. Indeed, I am only bringing it into this comment to illustrate the fact that I started off with something in my mind that was not very specific so far as milk is concerned.

I notice that Dr. Davis makes the comment that the cost would be fantastic, and I would be very interested to know on what foundation he has built that theory. So far as my own experience goes in comparison with my refrigerating plant at my farm, where I reduce the temperature of milk to 38° F.

* "Milk Pasteurisation and its Alternatives," p. 89.
† *The Dairyman*, September and October, 1944.

and store it at that temperature, I could not say that I would find that reducing steel to minus 120° F. has cost more; indeed, I think the comparison would be in favour of the deep-freeze apparatus. I am quite prepared, however, to admit that deep-freezing milk in large quantities is a problem that has to go a long way before it achieves solution, and what the result of it all would be is, I think, outside the scope of this discussion.

I certainly think that there are a number of points put forward by Dr. Davis that call for challenge. He speaks with a great deal of authority on matters on which I do not pretend to have any knowledge at all, but I am not satisfied that his own conclusions are justified. What I feel is this—I have studied a great deal of literature dealing particularly with patents covering a period of half a century and, in that time, it is obvious that many men of considerable scientific attainment have attempted to solve this problem of destroying pathogens in milk and that none of them, so far as I can learn, has achieved any success. Apart from a general dislike of pasteurisation, in which I feel I share Mr. Bernard Shaw's views, I do honestly believe that we have not gone nearly far enough with heat treatment to justify what we are proposing to do at this juncture.

In my county—Ayrshire—we have many very fine herds of cows which are attested, and the proportion of such herds is growing every day. Serious attempts have been made to improve our dairies, and I myself have got a dairy of which I am very proud. I have also constructed a byre and stockhouse in which I have paid every attention to giving accommodation to my herd under the most healthy conditions possible. Indeed, I feel sure that a great misfortune has befallen us in rushing along the scheme for pasteurisation, because I honestly think that at this stage of our very limited and uncertain knowledge it would be far better to give more attention to the health of our cows and to the conditions in which our milk is produced in the farm and dairy. I cannot but feel that, if every farmer in the country is to labour under the idea that clean milk is no longer a necessity, or indeed something to bother about, we will tend to slacken our efforts and rely entirely on heat treatment to destroy the evil effects that proceed from the farm itself. I feel sure that Dr. Davis will agree that clean milk is of the utmost importance, and that it is absurd to believe that nothing is to be gained by making serious efforts to obtain it. I do not doubt the earnestness with which he is seeking to get milk fit for human consumption, but I question seriously the rightness of the method he proposes to adopt. I have no doubt at all that his scheme for dried milk is one worthy of a great deal of consideration and, at the end of the day, it might prove to be the only true solution to the problem, but I think we are still a long way off that stage.

In the meantime I would like to add that I have made no further attempts with regard to the deep-freezing of milk, largely because I have received no encouragement from anybody at all, and I am a very busy man with many other things to occupy me. If the result of pursuing my investigations would meet with encouragement I should be most happy to take up the matter again, but up to the present time all the people with whom I have been in contact in the dairy world simply refuse to consider the matter seriously at all, which seems to me a very foolish state of mind, because there is at least this to be said, that little is known as to the general effect of deep-freezing of milk, and most of what is written is largely guesswork. It may be perfectly true—and I am not questioning it—that deep-freezing will not destroy all pathogens, but that does not mean to suggest that there may not be developments proceeding from deep-freezing that might lead to that much-to-be-desired result.

In conclusion, may I, as an engineer, be permitted to say that I have never yet seen any adequate means of obtaining heat treatment that could be called reliable. Everybody engaged in the industry seems to have stressed the question of temperature and time, and if these matters are as important as I believe them to be, then surely the most urgent question is, How are you going to obtain them? Temperature has varied in the minds of authorities quite a lot recently, and the length of time at which the milk should be maintained at the temperature has also been moved about, but the transference of heat to milk does not seem to me to be obtainable by present methods in the exactness required. I should be grateful if Dr. Davis would tell me just how it is to be done.

Mr. Edward P. Smith, M.P., writes:

Thank you for sending me so courteously the proofs of your article in which you deal faithfully with me for advocating the carbonation of milk. It is not the first time in my life when I have "rushed in where angels fear to tread," nor is it likely to be the last. Since writing my article I have had an opportunity, through the kindness of the Royal Society, of studying the latest American researches into the carbonation of milk and its bactericidal effects which, I am bound to admit, are only partial. I was led away by the fact that the carbonation of water is bactericidal, and, like the London dairyman of the mid-Victorian age, I too readily confounded milk with water.

But you will do me the credit of observing that I did say in my article that the only way to be sure of absolutely germ-free milk is to boil it. I am no opponent of pasteurisation as such, but I fear that far too often it arrives at the consumer's in an impure state. Some while ago, in my area, twenty-two out of forty samples taken for analysis were

found to be "unsatisfactory." In my own house all milk is boiled upon delivery; but I am one of those unfortunate persons who are born with an invincible dislike of milk, and therefore I cannot speak as to the effect upon my own palate, though my family tell me that they much prefer the flavour when boiled. I daresay, however, that this is merely due to the fact that they have grown used to it.

Dr. Davis's reply to the foregoing letters will be published in the next issue of FOOD MANUFACTURE.

TO THE EDITOR OF FOOD MANUFACTURE

DEAR SIR,—We have read with interest the article by George H. Rauch in your December issue on "Plum Butter." This commodity and its manufacture is quite known to us. We imported the raw materials necessary for its manufacture before the war, and under our own special process have made this all-round preserve for many years past—here in Maryport.

We thought this fact might interest your readers.

Yours faithfully,
LAKELAND FOOD INDUSTRIES, LTD.

City Analyst's Report

IN his annual report, Mr. F. C. Bullock, City Analyst for Leicester, points out that bearing in mind the special difficulties of the present time—fuel shortage, black-out and labour problems—the fact that the average percentage of all milk samples reported satisfactory reached the record figure so far of 98·3 per cent. in 1943 reflects credit alike on the efficiency of modern pasteurising plant and the intelligent use made of it by the local firms supplying the trade.

Other items which were examined included an "egg-substitute" which consisted of baking powder, containing turmeric, and another much-lauded substitute was a yellow-dyed baking powder short of carbon dioxide. Some pre-packed "freshly roasted coffee" came from the same pack that was not freshly roasted when analysed a year ago. In a previous report the City Analyst mentioned a sample that tasted more like cardboard than coffee. A bottle of colourless liquid (submitted privately) bore the name "Brandy Mint," with the claim, "Special double strength Brandy Mint." A similar sample, without the "special double strength" claim, was mentioned in the 1942 report.

As "Brandy Mint" itself is a hypothetical product of unknown composition, the double strength claim was equally meaningless and unhelpful. As might be expected, the composition of the sample was similar to that of the article previously encountered. It consisted of 99·8 per cent. of tap-water and 0·2 per cent. oil of peppermint, price 2s. 9d. a bottle. Proceedings were not taken, because the vendor had gone away.

"Frozen fruit juice" contained potato starch, and was sweetened with saccharin. Presence of the latter enabled the authorities to stop the manufacture of the "juice."

After mentioning other instances of misleading titles, the City Analyst says that with the rationing of tea and the high taxation of beer, plus the apparent generally held opinion that neat water lacks interest as a beverage, the consumption of so-called soft drinks has increased enormously in recent years. The unsatisfactory nature of many samples was referred to in the 1942 report. This branch of the food industry has proved very fertile ground for exploitation by upstart firms.

The Soft Drinks (Control) Order, 1943, which came fully into force on July 31, 1943, proved a very welcome item of legislation, alike to consumers, retailers and reputable manufacturers. The public is now assured of being able to obtain, at a recognised price, an article containing 25 per cent. of genuine fruit juice, complete with vitamin C content and 7½ per cent. of real sugar.

Concerning gelatine, which has been the subject of a large number of prosecutions in different parts of the country, Mr. Bullock says that although really a drug, it is usually purchased by the public to-day as a food, or rather as an adjunct to other foods, to give a solid consistency to something which is normally a liquid. Chemically, there is no sharp line of demarcation between gelatine intended for edible purposes and industrial glue, and there are no legal standards which apply, since the standards given in the B.P. could not necessarily be enforced for gelatine sold as a food. There are, however, common-sense standards which one might reasonably expect—*i.e.*, that the gelatine should "set" when made up according to directions; the "set" jelly should be tasteless, or at least palatable; and the "set" jelly should be wholesome and free from metallic contamination.

Absence of watertight standards has led to much inferior gelatine coming on the market in recent years, and some supplies have fulfilled none of the above conditions. Much evil-smelling stuff, suitable rather for the compost heap than for the pantry, has found its way on to the market, and maybe the refusal to "set" on the part of some samples has been a blessing in disguise, as this failing has automatically prevented the stuff from being eaten. Arsenic and zinc have been frequent metallic contaminants. The former is added to the hides and other animal tissues from which the gelatine is derived in the exporting country to prevent decomposition, and is difficult to remove entirely when once added.

On behalf of the Council's Water Committee, 278 miscellaneous samples of water were taken, and the fully treated water from all three local reservoirs was free from coliform organisms in 100 mls. on every occasion. This is the highest standard required in any drinking water supply, and implies safety from danger of water-borne disease. No branch of work handled in this department is more important than the safeguarding of the quality of the water supply, involving as it does the health of about 400,000 people.

In the City Analyst's opinion the chlorination process adopted some years ago has proved well justified. Using a smaller dose of chlorine than before, an adequate margin of residual ensuring safety is easily maintainable.

A New Canning System

SPECIALLY CONTRIBUTED

THE British canning industry may be justly proud of its efforts in the present world struggle, overcoming, as it has done, difficulties imposed by restrictions, handling unusual products and fulfilling heavy and urgent contract demands to keep the fighting Forces supplied with food. It has produced rations and emergency packs to meet special requirements and circumstances, putting aside everything else for this all-important work, but the canner is well aware that when this war-time demand decreases, trade will have to be sought through the former channels of marketing, with the return of competition, brand names, speciality packs and, more important, a buying public that will have regained its power of selective purchasing.

To meet these changed conditions a new type of food can, together with a much simplified type of self-contained continuous food canning and preserving line and an entirely different method of processing, has been evolved.

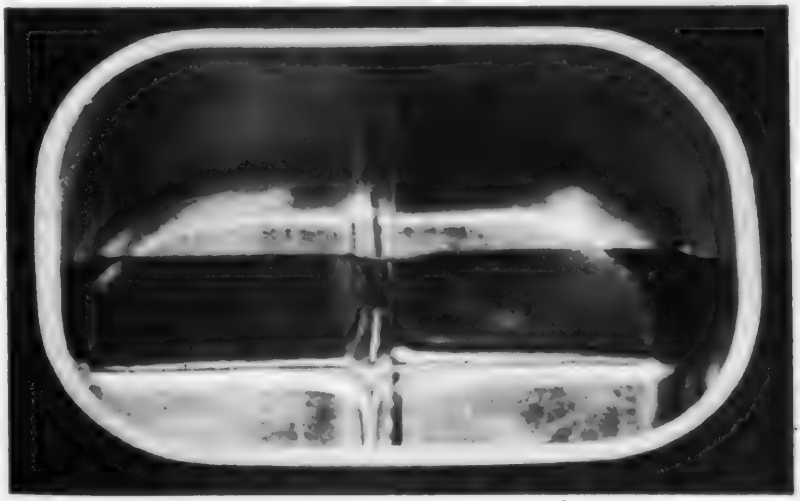
There are two novel aspects of this system—(1) the can, (2) the processing method.

The can has special features which make possible the dry heat system of processing.

The Can

The can has special features which make possible the dry heat system of processing employed. It is of rectangular shape, 4½ ins. by 3 ins. by 2½ ins., and has a nominal capacity of 16 oz. It is of special reinforced, one-piece, jointless construction, without side seam or spun-on bottom, and is strong enough to withstand the generated internal pressures during processing, thus obviating the necessity for the use of retorts in the sterilising operation.

The special cruciform corrugations that have been incorporated as reinforcing and strengthening



The special cruciform corrugations are reinforcing and strengthening devices which also act as guides whereby "egg-box" dividers can be inserted.

Rows stacked three or four cans high can be put together in interlocking formations between shallow rectangular wooden trays or pressed metal outers and be securely strapped together with steel strapping tape.

devices in the container also act as guides and locators, whereby simple "egg-box" dividers can be inserted, making separate compartments for composite or multiple packs when required.

These corrugations, both in the lids and the bases, are identical and may be used to superimpose the base of one can upon the lid of another, so that rows stacked three or four cans high can be put together in interlocking formations between shallow rectangular wooden trays or pressed metal outers, and be securely strapped together with steel strapping tape, making complete units of 24, 36, or 48 cans ready for distribution or storage, without using packing cases, wooden boxes or cartons, leaving the cans themselves visible for publicity purposes but secure against pilfering.

The containers require no soldering as there are no side seams to seal, and therefore are not confined to manufacture in tinplate only. They can be produced in other metals, such as lacquered bright steel strip, stainless steel, aluminium and its alloys, monel- or nickel-coated steels, sandwich metals, electrolytically tinned strip, or any plate or strip capable of metal working, some new types of which are now being developed for use in food packing.

The original shape of the container might appeal to the consumer as being of further use after the contents have been removed, particularly in the case of the new metals. Careful opening of the lid with a butterfly type of shearing seam opener, leaving no jagged edges, will convert the can into a pie dish, sugar basin, jelly mould, billy can or other useful domestic chattel, instead of being immediately discarded after opening as with ordinary cans. A special guillotine action opener, which takes out the lid clean around the edges by simple pressure, has been designed.

The container may also be used, if desired, in existing canning lines, and be filled, exhausted and processed in the same manner as ordinary cans where a canner prefers to retain his established processing methods, but wishes to adopt some of its advantages and special features; but the full benefit of these features are to be obtained only in conjunction with the self-contained canning line for which it has been specially designed and developed, and around which the new method of dry heat pressureless food preserving has been evolved.

The Canning Plant

The canning plant is a five-unit, self-contained continuous food canning line for the vacuum packing and preserving of all kinds of foodstuffs, including the making of the cans themselves while operating. It dispenses with the use of prefabricated can stocks, steam retorts, vacuum chambers, soldering, air, steam and water pressure systems, paper labels, labelling machines, packing cases, cartons and boxes.

The plant, which can be quickly set up without major structural installation work, consists of (1) combination body-making machine; (2) sectional two-way conveyor system; (3) drum-feeding vacuum

double-seaming machine; (4) elevating stove lacquer bath; (5) continuous pressureless dry heat processor.

The plant will handle 10 tons of primary raw materials per day, and turn out 2,000 cans per hour or 500 (48 × 1's) units per day, processed and ready for dispatch. The cans cost less to manufacture than prefabricated types.

Body-making Machine

This machine is a complete can-making plant in itself. It turns out flanged finished cans ready for packing in a continuous stream from coiled metal strip, and these cans are conveyed on the two-way conveyor system direct to the packing tables for immediate filling as required. It dispenses with the need of prefabricated can stocks and large storage spaces, the coiled strip being mounted on easily handled reels for loading into the machine. These reels are very compact and space-saving in store. The machine cuts out the flat blank from the strip and forms the body in one stroke, while a second operation on the side of the machine trims off and makes the seaming flange around the top of the can ready to receive the lids, so that the can is completely finished when it leaves the machine.

The Conveyor System

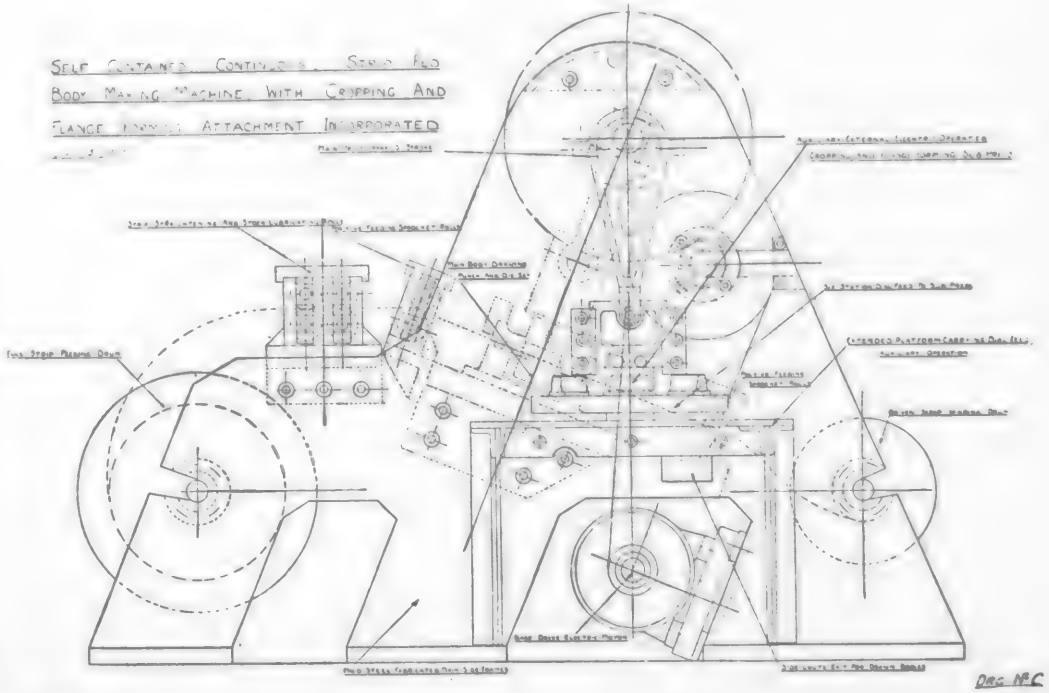
The conveyor system has a power-driven leading section, which can be set down at any convenient position by the main machines and be built up with the 6-ft. box sections and "U" clip joints for any length to the farthest point where packing is taking place, and the pulley mounted return section attached to complete the run. A light-weight two-ply 3-in. belt is threaded throughout over the top deck and back through the bottom deck and joined up with fasteners. Wipe-off and overflow facilities are provided at each end to deal with surpluses and bottle-necks.

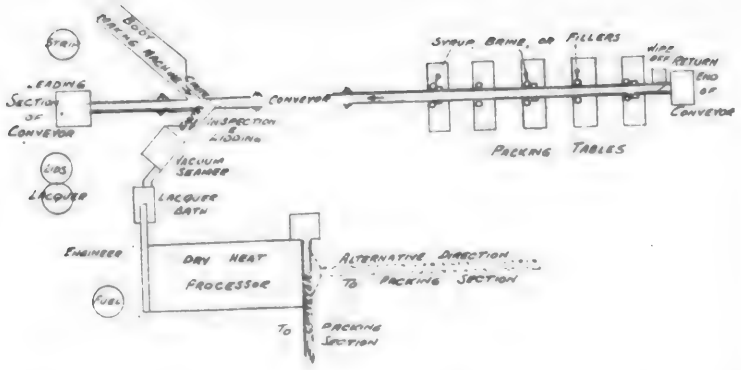
Instead of using long packing tables with a central conveyor to make the packing line, short tables are set at correct intervals across this conveyor system, as many as are required for the particular product being processed. These tables can be quickly and simply built from cut lengths of common ¼ in., ¾ in., or 1 in. piping joined together with the rapid "Kee Klamp" system of pipe erection, the tops being made of T. & G. boards covered with stainless steel sheeting.

Each table comprises its own complete packing station with its charge hand, thereby enabling closer supervision to be exercised and giving more scope for team work among the operatives. The empty can is taken from the lower belt; it is then filled and placed on the upper belt, and proceeds to the capping and inspection tables and thence to the vacuum double seamer.

Vacuum Double-seamer

The vacuum double seamer is of special, much simplified design, free from cover feeds, critically


SELF CONTAINED CONTINUOUS STRIP FED
BODY MAKING MACHINE WITH CROPPING AND
FLANGE FORMING ATTACHMENT INCORPORATED
DRG. NºC

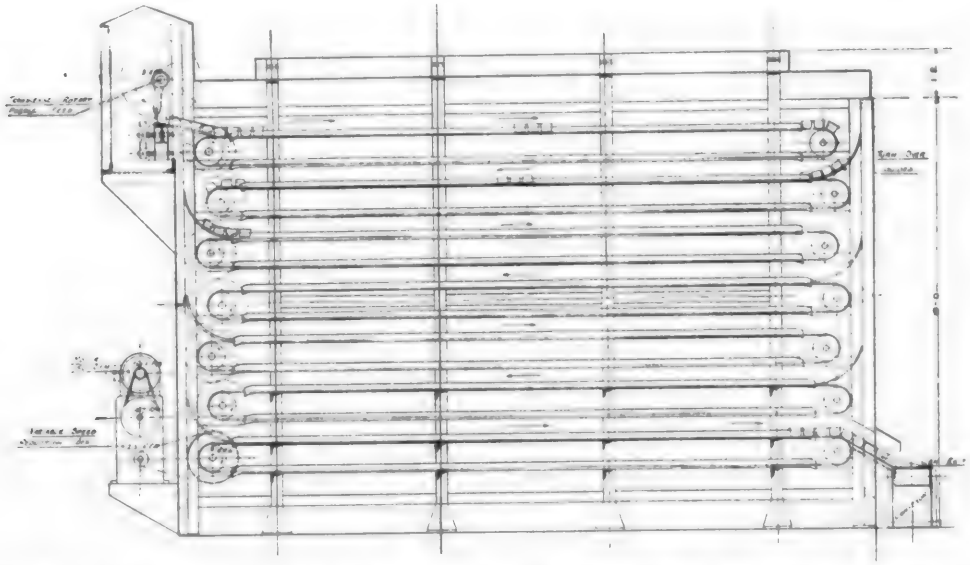


The Conveyor System.

timed chain conveying and incidental cam arm subsidiary movements, the cans being presented to the seaming head by a method of drum feeding which is non-mechanical and therefore much less prone to breakdown or jamming. The machine is a self-contained unit, including the vacuum receiver and vacuum pump, requiring no pipe lines or external services to operate, except electrical wiring up to the starter switch. The seaming head and vacuum pump are triangularly driven with Vee belts from one motor in the base of the machine. The operator in charge can feed the cans to the drum—or an automatic feed can be fitted—at the rate of 40 per minute, while watching the vacuum gauge for correct exhausting; thereafter the machine itself takes them through the cycle of operations and drops them, exhausted and hermetically sealed, into an exit chute without attention.

The machine is under the full control of the operator or supervisor, and the operations can be immediately stopped by a touch of a foot pedal to avoid damage to cans or "jams" building up while the seaming head mechanism comes to rest.

From the vacuum double seamer the cans are conveyed to the lacquer dipping bath, from which they are slowly elevated in an inverted position—for the surplus lacquer to completely drain off—to the entrance of the continuous dry heat processor. Where the extra coating of protective, tinted, transparent lacquer is not required by the packer, the



The cans enter the continuous dry heat processor in single file and are slowly conveyed in rows along the travelling belts, gently turning over and dropping down from belt to belt until they emerge at the exit end—finished and processed.

lacquer bath can be used as a degreasing or washing unit for cleaning off the outsides of liquid packs where spilling might have taken place and stains and marks have been left. The lacquer that is used in this bath is not of the air-drying qualities of war-time packing, but a full-bodied stoving quality, which gives a brilliant "baked-on" enamelled finish to the cans when they emerge from the processor.

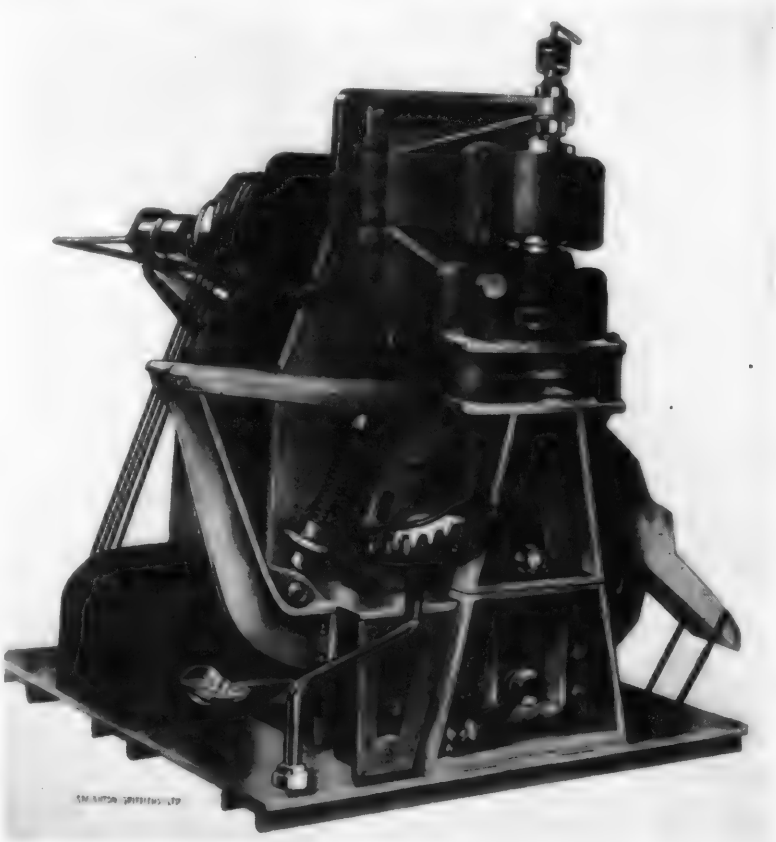
The Continuous Dry Heat Processor

The cans enter the continuous dry heat processor in single file and are slowly conveyed in rows along the travelling belts, gently turning over and dropping down from belt to belt until they emerge at the exit end—finished and processed. They pass through three controlled heat zones during the process. The first zone has the highest temperature, to receive the cans when they are in the condition to absorb initial heat rapidly; the second zone has a slightly lower temperature to maintain the heat penetration into the cans as they approach the sterilising temperature required by the product; the third zone is held at sterilising temperature. The temperature curve of the can contents is in opposite ratio to the temperature curve down through the heat zones of the processor.

The heat medium is rapidly-circulated live air currents through a closed circuit, thermostatically controlled in each zone to maintain the required temperature of each, and the gentle turning over from bottom to top of the cans as they drop from belt to belt sets up an all-important slight agitation of the contents which assists convection and conduction currents and increases the rate of heat penetration through each individual can, and also prevents the separation of fats and solids in meat packs which appear so unsightly on opening.

The cans are conveyed away from the dry heat processor to the packing department, and cooling, if required, can be arranged by passing this conveyor line through forced air draught tunnels or cold water spray troughs.

Lids are supplied to the canner printed and solutioned ready for use in the plant, and full scope of the art of metal colour lithographing may be employed to display attractive content pictures, brand names, trade marks, etc., in brilliant multi-coloured enamelled finishes on these lids.



The vacuum double seamer is of simplified design, free from cover feeds, critically timed chain conveying and incidental cam arm subsidiary movements, the cans being presented to the seaming head by a method of drum feeding which is non-mechanical.

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, April 1, 1945, page 127.

No.	*Date.* 1944.	PRICE FIXATION ORDERS
1270	Nov. 13.	Rhubarb (Maximum Prices) Order. Revokes S.R. & O. 1943 No. 1642.
1278	,, 15.	Order amending the Fish Cakes (Maximum Prices) Order, 1943.
1279	,, 15.	Tartaric Acid and Cream of Tartar (Control and Maximum Prices) (No. 2) Order.
1296	,, 20.	Order amending the Meat Products, Canned Soup, and Canned Meat (Control and Maximum Prices) Order, 1944.
1300	,, 21.	Citrus Fruit (Maximum Prices) Order. Revokes S.R. & O. 1941 No. 179; 1943 Nos. 1584 and 1732; and 1944 Nos. 224 and 610.
1308	,, 23.	Qrder amending the Poultry (Control and Prices) (Northern Ireland) Order, 1943.
1333	,, 30.	Order amending the Poultry (Control and Maximum Prices) Order, 1943.
1340	Dec. 1.	Order revoking the Straw (Maximum Prices) (Northern Ireland) Order, 1941. Revokes S.R. & O. 1941 No. 1198 and 1942 No. 495.
1349	,, 5.	Order amending the Feeding Stuffs (Maximum Prices) Order, 1943.
1380	,, 19.	Biscuits (Charges) Order. [Emergency Powers (Defence) Act, 1939. S. 2.]
1391	,, 11.	Order amending the Fish (Maximum Prices) (No. 2) Order, 1944.
1451	,, 29.	Order amending the Home Grown Apples (Maximum Prices) Order, 1944.

		FEEDING STUFFS
1199	Oct. 21.	Order amending the Feeding Stuffs (Regulation of Manufacture) Order, 1944.
1443	Dec. 22.	Order amending the Feeding Stuffs (Regulation of Manufacture) Order, 1944.

		FLOUR
1436	Dec. 21.	Order amending the Flour Order, 1944.

		FRUIT
1291	Nov. 18.	Fresh Fruit and Vegetables (Restriction on Dealings) Order. Revokes S.R. & O. 1943 Nos. 5 and 1433.
1297	,, 20.	Order amending the Canned Fruit and Vegetables Order 1944.

No.	*Date.* 1944.	MILK
1358	Dec. 6.	Order revoking the Condensed Milk (Milk Content) Order, 1940.

		PICKLES AND SAUCES
1442	Dec. 22.	Order amending the Pickles and Sauces Order, 1944.

		POINTS RATIONING
1355	Dec. 6.	Order amending the Food (Points Rationing) Order, 1944.
1356	,, 6.	Order amending the Food (Points Rationing) Order, 1944.
1357		Directions (Christmas—extra rations).
1359/S66		Directions (New Year—extra rations, Scotland).

		POTATOES
1408	Dec. 15.	General Licence under the Potatoes (General Provisions) Order, 1944, and the Potatoes (1944 Crop) (No. 2) Order, 1944.
1450	,, 29.	Order amending the General Licence, December 15, 1944, under the Potatoes (General Provisions) Order, 1944, and the Potatoes (1944 Crop) (No. 2) Order, 1944.

		PRESERVATIVES
1311	Nov. 23.	Relaxation of provisions relating to food preservatives, condensed milk and preserved eggs.

		RATIONING
1041	Sept. 4.	Order amending the Directions, October 23, 1943, Supplementary to the Feeding Stuffs (Rationing) Order, 1943.
1065	,, 13.	Order amending the Bacon (Rationing) Order, 1944, and the Meat (Rationing) Order, 1944.
1115	,, 28.	Order amending the Fats, Cheese and Tea (Rationing) Order, 1944.

		VEGETABLES
1291	Nov. 18.	Fresh Fruit and Vegetables (Restriction on Dealings) Order, 1944. See Fruit.
1297	,, 20.	Order amending the Canned Fruit and Vegetables Order, 1944. See Fruit.

Microbes that Aid Digestion

The nutritional role of the microflora in the alimentary tract was treated in a series of papers and subsequent discussion at a recent meeting of the Nutrition Society.* In this article the present state of knowledge of the subject is outlined.

SPECIALLY CONTRIBUTED.

IN THE alimentary tract of animals there is an enormous variety of microflora and microfauna—bacteria, protozoa, yeasts—which for the purposes of this article will be called microbes. It is important to realise that though some microbes cause diseases the great majority of varieties do not. Many are beneficial or even essential to other living things. When different creatures live in close association for mutual benefit—*e.g.* microbes with sheep—they are called symbiotes. Under normal conditions these alimentary microbes grow fast, their numbers being doubled in 24 hours, perhaps much less. They float in the fluid contents of the alimentary tract along with chewed food and digestive juices. The water in this fluid or "liquor" comes mainly from saliva and other digestive juices which are poured in as fast as products of digestion are absorbed. An idea of the bulk of the liquor can be obtained from the fact that the cow secretes a hundredweight of saliva a day.

Carbohydrate

In pasture grass, hay, etc., the principal carbohydrate is cellulose. Mammals do not elaborate an enzyme which digests cellulose. Yet ruminants obtain a major part of their calories ultimately from its combustion. The digestion is carried out with the aid of symbiotic microbes living as guests in the alimentary tract of the host. The first step is the breakdown of the cellulose, *outside their own bodies*, by extracellular enzymes poured on to it by these microbes. The course of the digestion can be followed with the aid of microscope and polarised light. The first products of pre-digestion are probably sugars, though this does not seem to have been definitely proved. A part of this "sugar" is doubtless absorbed by the host, but the absorption has not yet been established as a fact. The major part of the sugar is absorbed by the microbes, in which some is synthesised to cell substance, some is fermented to provide energy for growth. A major product of fermentation is methane, which is blown off and wasted.

Among the other products of fermentation are the lower fatty acids: acetic, propionic, butyric, quantitatively in that order. The amounts present are considerable: 350 g. of acetic acid were actually isolated from the intestine of a dead horse. The arguments that these acids are produced in the tract from food ingested are based on these facts: (*a*) only very little volatile acid can be extracted from grass, oats and other fodder; (*b*) their concentration in the alimentary tract increases shortly after taking food; (*c*) the course of the increase varies with the food, being faster with sugar or starch than with hay.

In sheep and cattle there is a kind of large extra stomach, called the rumen, through which food must pass before it reaches the true stomach. The results for (*b*) and (*c*) above were obtained by withdrawing samples of liquor through a fistula to the rumen of a sheep. For example, a solution of glucose was put in. Every hour a sample of the liquor was withdrawn and analysed for glucose and acids. The glucose disappeared over a period of 9 hours. Volatile acids appeared, reached a maximum in 5 hours, and thereafter they too disappeared. A smaller amount of lactic acid also appeared and disappeared, and experiments showed that certain microbes ferment the lactic acid to propionic acid.

Not only did these acids disappear but when sodium acetate was added it too disappeared. None was found lower down the alimentary tract. The belief that it was absorbed into the sheep's blood from the rumen itself was confirmed on finding it by chemical analysis in the blood stream leaving the rumen. Having been absorbed into the animal's blood, what happens to these acids? They are not excreted unchanged. A sheep was given phloridzin, a drug which so deranges its kidneys that sugar is found in its urine as in a diabetic. The extra sugar thus wasted was measured after feeding the animal. A rise was found two days after feeding hay and immediately after giving a mixture of volatile acids. Other experiments are needed to complete the picture, but it seems certain that propionic acid at least can be converted by the sheep into sugar. Hence the sheep obtains energy food from cellulose with the help of the microbes it shelters, and probably satisfies at least a sixth of its calorific needs in this way.

When a sample of alimentary liquor is treated with iodine and examined microscopically many organisms are found to be stained blue or brown, from which it is argued that they have synthesised

* The full speeches with discussion and speakers' names will be published in the *Proceedings of the Nutrition Society*.

and stored starch or glycogen. The quantities stored under different conditions can be studied, and the synthesis can be followed. Such storage is dependent upon the intake of cellulose. There are many more varieties of iodophils (iodine-staining microbes) than there are of cellulose dissolvers. Now, although these microbes multiply rapidly and are presumably carried along the alimentary tract, the population dwindles as the mass progresses. Indeed, our faeces contain no protozoa and not many large bacteria. This suggests that the animal has digested and absorbed the bulk of the microbes which thrived so well in the rumen.

Cellulose, then, is hydrolysed to "sugar," part of which is absorbed by the host, part by microbes. Of the latter, part is fermented with the production of organic acids which are waste products for microbes, but food for the host, and part is converted into more microbes which the host later digests and absorbs.

Protein

The herbivore obtains its protein in three principal ways. The protein in herbage is liberated when the cell walls have been digested. Part of this protein is normally digested and absorbed by the host. Part is used as growth material by microbes which are later digested and absorbed by the host, as discussed above. Microbes also synthesise a part of their own body-protein from non-protein molecules, and much of this protein also eventually becomes host protein. Proteins are complex organic nitrogenous protein. Soil bacteria synthesise them from simple nitrogen compounds (a common one being urea) and simple carbon compounds. The extent of a similar synthesis by alimentary microbes is still a matter for controversy. A great mass of experiments has been carried out, but owing to numerous difficulties the results of different experimentalists conflict. The great size of the animals involved makes measurement difficult, the times long, and the cost very great. For these reasons experiments are sometimes performed in bottles and test tubes. Reactions *in vitro* may not be the same as *in vivo*, and conclusions from the former cannot always be validly extended to the latter. The following types of experiments are being performed.

Milk Production Curves

Milk production curves on different feeds are commonly made. In one series of experiments urea + starch was found to be as good as bloodmeal, and 28 per cent. of the urea nitrogen went, in the form of protein, into the milk. About a quarter of the urea given found its way unchanged into the urine and was wasted. Urea was also found to be nearly as good as protein for the growth of calves. In another set of experiments ammoniated beet pulp was found to be almost as good as soya bean meal for raising calves. The meat was perfect and no kidney damage was observable. Sheep grew satisfactorily and produced good wool on non-protein nitrogen. Pigs, on the other hand, do not seem to be able to subsist on protein substitutes, and, indeed, the phenomenon seems to be restricted to ruminants. A fistula was made to the rumen of a cow (the cow remained happy and affectionate!) and covered with a screw top. Samples from the 40-gallon rumen were withdrawn and attempts were made to follow the course of the conversion of urea to protein by experiments *in vitro*. By adding bactericides in graded amounts the synthesis of protein in the bottled liquor was shown to be brought about by microbes. Other experiments demonstrated that carbohydrate (*e.g.*, starch) was also necessary for protein formation. Calculation showed that 300 g. of protein a day could be formed from urea and cellulose: that is, about a quarter of the cow's requirement. In experiments in other research institutes, however, urea actually depressed the formation of protein, as though by poisoning action.

Is it commercially possible to feed urea? It might be in some countries where the feed is low in nitrogen. In this country feeding-stuffs are shorter of carbohydrate than of nitrogen. Moreover, at the present time there is a world shortage of urea, owing to the great needs of the plastics industries.

Location of Activity

The rumen is the site of intense microbial activity. It is here that cellulose is digested, fatty acids formed, and protein synthesised. In such non-ruminants as the horse the microbial activities are believed to occur largely in the caecum, a closed-ended appendage to the alimentary tract. The rabbit voids two types of faeces, one by day, one by night. The latter evidently is not strictly faeces. Its composition is the same as that of the caecal contents. The rabbit reconsumes it all, thereby obtaining a second extraction after the caecal microbes have been at work.

Vitamins

Several observations show that B—and perhaps other—vitamins are produced by alimentary microbes. For instance, the cow does not need any aneurin (B_1) in its food. Areurin, riboflavin, nicotinic amide, pyridoxin (B_6), biotin, pantothenic acid and vitamin K have all been found in larger amounts in the alimentary tract of a cow than in its food. Carbohydrate in the food is an essential condition for this synthesis. Vitamin production by microbes is known to be correlated with active fermentation, and the rumen is an incubator which seethes with fermentation. In non-ruminants the fermentation is less intense and occurs too low in the alimentary tract for considerable absorption to occur. Nevertheless, experiments show that vita-

mins are produced to a limited extent by microbes in non-ruminants. The production can be prevented by sulphonamides, drugs which poison microbes. A certain beetle flourishes on wholemeal or on white flour: after its symbiotic microbes have been destroyed it grows on the former, but on the latter it fails to grow and six water-soluble vitamins are no longer detectable. Members of the B series of vitamins have been found in bird faeces. Small amounts of vitamins are produced in the rat's gut, but the proportions absorbed by the host are not normally enough to maintain its health. Under certain conditions rats, on a diet containing starch but no aneurin, consume their own faeces, continue to grow, and show no signs of bradycardia. Apparently aneurin—and sometimes other vitamins—are produced from the starch in the alimentary tract.

Refection

A special type of vitamin production by rats is known as "refection." The occurrence of refection is highly erratic. It occurs among rats in some laboratories only, on diets containing raw starch, and not always then. Refection seems to be connected in some way with indigestibility of starch. It is rarely produced with boiled starch. The faeces of refecting rats are white and bulky (instead of the normal black), through containing large amounts of undigested starch. Indeed, the starch has been changed to a less digestible form in its passage through the rat's gut. There are hints of the occurrence of refection in other animals. Many explanations of the origin of refection have been attempted. None is entirely satisfactory. The phenomenon remains a mystery, although it is agreed that microbes are concerned and that a vigorous fermentation is occurring. The rat has become a kind of amateur ruminant.

Refection may become a major nuisance in the laboratory when it is desired to use rats for the bioassay of aneurin in fresh and processed foods. To overcome it sugar may be used instead of starch in the basal diet. But when the foodstuff to be assayed itself contains starch it can be given all in one dose, so that the assay is done before refection can interfere. This precludes growth curves, but suits the bradycardia test.

The Case of Man

The human intestines normally contain a large mixed population of microbes. Do these help man directly? There is some clinical evidence of limited microbial production of B vitamins and of vitamin K, but it is not conclusive. In the present state of our knowledge it seems unlikely that cellulose is digested or that protein is synthesised from non-protein nitrogen in the alimentary tract of man.

Quality in Fruits and Vegetables

AS a consumer of fruits and vegetables almost everyone considers himself a judge of the quality of these food products. In this respect he is something like the art patron who confesses that he knows nothing about art, but he knows what he likes. These intangible elements of quality to the consumer have become very definite ideals to the plant breeder, the farmer and the food processor. It has meant prosperity to the farmer and to the food processor to find out what the consumer likes and to give it to him.

Hidden Qualities

In recent years, however, there has been an increasing consciousness on the part of those devoting their efforts to the improvement of quality in fruits and vegetables that attention must also be paid to hidden qualities in food products—the qualities which are not apparent to the consumer but which have an important bearing on his health and welfare.

At this time the important hidden qualities in fruits and vegetables are apparent more to the nutritionist than to any other group of scientific and technical persons working in the food field. The nutritionists have a wonderful bill of goods to sell, but so far this bill of goods has been sold to only a very small percentage of consumers.

The success of this sales campaign, so important to the overall welfare of the nation, requires the highest type of co-operation between all those scientific groups working toward the common objective of quality, hidden as well as apparent.

The plant explorers searching the world for new varieties of fruits and vegetables and new variations of the old varieties must continue and intensify their searches. The plant breeders must improve these varieties and adapt them to our prevailing soil and climatic conditions.

The agronomist will continue to develop improved methods of agriculture so that the product of the plant breeders can be produced economically on our farms. Improved methods of transportation will be developed to get these improved fruits

Abstract of paper delivered by Thomas M. Rector, vice-president, General Foods Corp., New York City, before the Symposium on Food Quality and Flavour of the Division of Agriculture and Food Chemistry, at the 108th meeting of the American Chemical Society.

and vegetables to market and processing plants under the best possible conditions.

Entomologists and microbiologists will continue the battle against insect pests and diseases caused by micro-organisms. Industry has the responsibility of providing better insecticides, better fungicides and better means of contending with plant diseases caused by bacteria.

The chemists of the fertiliser industry will continue to lower costs and improve the quality and efficiency of our plant foods.

The technical staffs of food processors will see that progress does not lag in the improvement of food processing methods for the purpose of preserving not only apparent quality elements, but also the hidden virtues of vitamins and minerals.

All of these groups must and will continue their efforts, working individually and collectively, but our biggest chance to accelerate improvement of quality in fruits and vegetables, however, must come from better organisation and co-operation between all of these groups.

Democratic Managerial Principles

Now that we can see some indications that the war clouds will lift in the reasonably near future, it is certainly a good time to look at this problem as a whole and to study how democratic managerial principles can be applied to get the quality improvement desired through co-ordination and co-operation.

In the field of fruits and vegetables, we find three broad general classifications of research and development work:

(1) Scientists in our universities and experiment stations are concentrating on fundamental work in the broad field of agricultural chemistry in all its phases.
(2) The Federal Government has developed a great research, development and advisory organisation to help and guide us generally.
(3) Our food industries through trade associations and individual corporations have established large and efficient laboratories devoted to food processing.

All of this scientific effort is aimed at one common objective—supplying our 135 million consumers with food which is both pleasing and nourishing. All of this work is being done well and we are progressing towards better quality in fruits and vegetables and in our food products generally. It is certain that a continuation of these efforts will result in improvement affecting every phase and element of quality, but we should ask ourselves, "Are means available for accelerating these improvements?"

Our problem therefore is, "How can these activities be better co-ordinated to reach this common objective more quickly?"

Good Organisation

The solution to this problem lies in organisation. The application of good organisation and management principles to the problem of food improvement generally calls for the formation of an overall national advisory board representing the three major factors involved.

Obviously, this board must not be set up as an all-wise governmental directing agency. Its functions should be to give advice and to make studies and recommendations. It should be so selected that its advice and recommendations would be respected by all those engaged in food research activities. It should seek to influence by its wisdom rather than to force by totalitarian methods.

Perhaps this can be done within the framework of the National Research Council. In certain parts of the food research field this body already has strong influence, particularly in the field of nutrition. Such matters, however, are details and this is presented merely as an attempt to suggest a means of filling an important gap in organisation.

Aims of Research

This board should have the following aims:

(1) To study the entire field of food research and determine what has to be done.
(2) To sub-divide the problem into its many phases and allocate to each major group its responsibilities in the field.
(3) To develop a spirit of co-operation between these groups so that the work of one group will supplement that of another.
(4) By better co-operation of industry with Government to force the poor-quality producer to improve the quality of his product.
(5) To change the attitude on the part of Government and State food law enforcement authorities from one of "You can't do that" to "Let's see how we can do it."
(6) To change the trend toward rigid definitions of food products which tend to restrict progress.
(7) To encourage quick, concise reporting of research results and more widespread and early dissemination of these reports.

One of the most important, if not the most important, elements of strength in a nation is the health and strength of its individual citizens. This health and strength is influenced as much by the food habits of the individual as by any other single factor.

Our future as a nation is intimately tied up with the nutrition of our citizens, the best nourished in the world. We also have the necessary organising and managing ability if it can be applied to the problem. Now, all we need is the will to do the job.

Salt-Makers and Salters

M. SCHOFIELD, M.A., F.R.I.C.

LONG before salt as source of soda, caustic soda and chlorine opened up that stirring chapter in chemical history, a chapter in which men like Nicolas Leblanc and Solvay, Muspratt and Gamble, lost or won fortunes in our great alkali industry, everyday "common" salt had played a more striking rôle in food. The preservative first used after man improved on his method of cutting meat into strips and drying it in the sun; the ancient symbol of preservation and incorruption when our forefathers swore to "keep a covenant of salt" or when they threw salt on a brewing mash "to keep the witches out"; the salt of which Roman soldiers roaming Britain drew a ration as part of their "salary"; such are examples of its early impact on civilisation. The very word is the keynote in quotations such as: "He is not worth his salt," or "If the salt has lost its savour," or Justice Shallow's "We have some salt of our youth in us."

Man's six or seven ounces of salt in him, which must be replaced when lost by perspiration, is hinted at when heavy workers or miners demand their salty bacon or other salty food, or they will suffer "heat cramp" or "miner's cramp," a condition relieved by drinking salt water. Our bacon research associations know well enough that even paterfamilias, after his week-end rounds of golf or vigorous exercise in the garden, relishes his salty bacon on those inevitable "Monday mornings." The lives of babies have been saved by injections of brine. Cattle must have their salt licks, and Cheshire ponies in the salt mines contentedly lick through the walls of their stables.

The Makers

The makers of salt—by saltmen first called *salinarii*—and those users of it who bound themselves into a guild of brethren which eventually grew into the Salters Company, have likewise occupied a striking place in our social history. To begin with the salt-makers one must mention those Romans in Britain who boiled down our brine in leaden pans, since cold, bleak Britain could not reap full advantage from the old saying that "nothing is more useful than sun and salt." This boiling down is the basis of our salt-making to-day. Yet England had at one time her salinas—small moderate affairs compared with those vast salinas like that at Cadiz with an annual production of 300,000 tons, or at Alicante with 216,000 tons, or even better, that in one-time Italian Somaliland, the world's largest salt producer with 700,000 tons annual production. (Such salinas or artificial lagoons yield a vast white expanse of salt beneath a tropical sun, a harvest broken up by ploughs drawn by oxen or Ford tractors according to the advance of "civilisation.") Near Lymington at King's Saltern, at Bittern and Hayling Island (*hals* is salt), and elsewhere there were minor salinas requiring a further boiling down of brine in iron pans in the winter months. But the salt-makers prospered from solar salt and paid their £60,000 salt tax with the usual grumbling. Lymington "bay" salt was much favoured because of a faint sea aroma and a violet tint due to local soil constituents.

Discovery of Inland Brines

Britain's salt-making underwent a change in venue with the discovery of inland brines more concentrated than sea water and close to plentiful supplies of fuel in the form of forest wood. Incidentally, our forests were depleted by brine boilers just as they were by iron smelters and glassmakers. Apart from Cheshire and Stafford supplies—which became sole sources of British salt—there were other springs like Cheltenham salt streams discovered when pigeons were noticed feeding from the salty residue of such streams; or like Droitwich, where brine of a density equalling that of the Dead Sea begin to be worked as early as 816. In Leland's time 6,000 "loads" of salt were dispatched per year from Droitwich.

Two episodes illustrate the fervour to make salt. In 1725 Sir Richard Lane became so inspired by the depths of the Cheshire workings that he considered Droitwich might go deeper; so the floor workings were pierced and brine gushed up with sufficient force to drown two workmen. A second event, due to the Droitwich roads being so bad as to delay transport of salt, was a scheme for a great pipe-line from Droitwich to Hawford, a scheme into which Baker, an apothecary, put £12,000—and lost it, since he had no legal rights and the pipe-line remained uncompleted.

Stafford Salt

Cheshire salt and brine have been much written on since the days when Volta was thrilled with his visit to the workings and with the "most agreeable and surprising sight" of hundreds of salt-miners with their paraffin dips. But to complete the true picture of British salt-making to-day one must not miss Stafford. There, on a common north of the town, are three salt works depending on a

constant source of brine pumped from 400 feet below. Two concentration processes are in use: the first for fine table salt, using multiple-effect evaporators after precipitation of magnesium and iron; the second is open pan boiling, which is more noteworthy since it illustrates a survival of the oldest of salt-making processes and yields a coarser salt for bakers, butchers, fish merchants and others dealing with food. The brine boilers, swarthy figures naked to the waist suddenly looming up from the clouds of steam below the low roofs, have a language of their own. "Let your speech be always with grace, seasoned with salt." The scriptural quotation is fully borne out where the seasoning is concerned. Standing on wooden surrounds or "hurdles" or on the "caboose" or stage above a firing space, one watches the salt-makers raking the separated salt into "tubs" or elmwood moulds resting on wooden "dogs" on the inner side of the huge shallow pans. When full and drained the upper ends of moulds are flattened by "happing" with wooden pats or "happers." By "dodging" or poking with iron rods the removal of scale from the bottom of the pans is ensured, thus avoiding a blow-out due to entrapped steam and hardness in the brine. Iron pans are supported on "dollies" or iron pillars, while stoking with coal slack is done below at the "forbeys" or firing hearths with repeated removal of ashes, called "bassing." Hardened pieces of salt formed below by percolation are removed—"getting the cats out," as it is called. The blocks of salt from the moulds are stacked in long horizontal brickwork flues in hothouses, the "picking of a ditch" or removal to a higher and hotter part being done by "lofters." Finally, blocks are shaped by circular saw, others cut into smaller household blocks, others, together with the cuttings, being crushed to salt for bakers, butchers and food manufacturers.

Salting of Food

After salt-makers one turns to a class of salt users who were concerned with the salting of food. London's early days saw salt manufacturers and merchants moving to the establishment of a guild or fraternity, this later acquiring letters patent in the thirty-seventh year of Edward III. and becoming one of the great livery companies. In 1684, when the Drapers held a pageant with twelve characters representing the twelve companies, the "Salters" were represented by Salina in a sky-blue robe and holding a buckler with the arms of the Salters on it. The Grocers, the Salters and the Fishmongers are examples of interest to food distributors. As far back as 1180 there were the Pepperers, first meeting in Soper's Lane, now Queen Street, who were traders importing spices from the East together with wine and confectionery from Italy—hence the term "Italian warehouseman." Twenty-one years later the Pepperers became the Grocers, since they sold their spices, drugs and tobacco by *le gros* or wholesale.* The Fishmongers were close brethren of the Salters, establishing themselves geographically near in Bread Street, and prospering like the Salters from the ban on meat-eating in Lent—prospering despite the prices prevailing in the days of Edward I. when best soles cost threepence a dozen and oysters twopence a gallon. "Of all nacyons and countres, England is best served of Fysshe, not onely of al manner of sea-fysshe, but also of fresshe-water fysshe, and of all manner of sortes of salte-fysshe," wrote Andrew Boorde. And since the transport for fresh fish was lacking, most of the fish brought to the chief water-gate, Queenhythe, was salted or pickled.

The Salters' Company

The Salters' Company, incorporated just 550 years ago, prospered under Richard II., who took great interest in them, granted them a charter and establishing them as a Livery Company. Other kings granted other charters; the fraternity grew up eventually to become the famous company establishing the Salters' Institute of Chemistry with its Fellowships, scheme of grants, and its almshouses for poor salters. The Middle Ages experienced difficulty in supplying fresh meat and fish, and this, together with the churches' ban on meat-eating days, caused the Salters to flourish. 1641 brought the purchase of the "Great House of London Stone or Oxford House," one-time residence of the Priors of Fortington in Sussex. This hall perished in the Great Fire of London, was rebuilt, and pulled down in 1827 to give way to the present Salters' Hall. *Sal sapit omnia!* Such became the motto of a company which prospered because man must have his fresh food and ration of salt as of old. The prices of poultry or other protein food favoured during the course of the war will cause one to ponder with envy the fare at the Salters' feast of 1506, which included: 36 chickens, 4s. 6d.; one swan and four geese, 7s.; two rumps of beef tails, 2d.; six quails, 1s. 6d.; half a hundred eggs, 2½d.; one bushel and a half of meat, 8d.—and salt, one penny.

* An alternative view is that "Grocers" is derived from *Grossarii*, a later name for the Pepperers given charge of the *peso grosso*, or Great Beam, called thus because larger weights of 15 ounces to the pound were used.

British Material for Export

Overseas readers are advised that the fact that goods made of raw materials in short supply owing to war conditions are advertised in FOOD MANUFACTURE should not be taken as an indication that they are necessarily available for export.

Trade News

War Damage Act, 1943 (Part II)

The Board of Trade announce that all policies under the Business Scheme which were in force on March 31, 1945, will be extended until June 30, 1945, without further payment of premium or further action on the part of policy holders.

For new or additional insurance under the Scheme the rate of premium for the three months April 1 to June 30, 1945, will be 1s. 8d. per cent., with a minimum premium of 5s.

* * *

Post-War Packaging Problems

Among the many post-war questions crowding in upon manufacturers is the important one of packaging, affecting as it does costs connected with breakage, freight charges, storage space, and handling. Packaging also has its influence on goodwill, for it can avoid the irritation of transit breakages, contribute towards a good first impression and smooth the transfer of goods from manufacturers to customer, added to which is the outstanding advertising value of printing on the outer surface of the container.

As a consequence, there is considerable activity among packaging manufacturers in planning and in helping others to plan. The Thompson and Norris Manufacturing Co., Ltd., originators of corrugated fibreboard packaging, are offering their services to help manufacturers to take advantage of this adaptable form of packaging in solving the post-war problems that are already making themselves felt. The low first cost of corrugated packaging, its combination of lightness with strength, and the fact that it is non-returnable, offer a way of keeping costs down.

* * *

The British Aluminium Company, Ltd.

The address of the British Aluminium Company, Ltd., is Salisbury House, London Wall, London, E.C. 2.

OBITER DICTA

- London children have gone ice-cream crazy.—*The Evening Standard.*
- You will be getting *some* tinned fruit soon after V-Day. *Noel Barber in "The Daily Mail."*
- I believe that agriculture and manufacturing industry in this country must, after the war, be dovetailed.—*Mr. R. S. Hudson.*
- The Judge: "Have you seen a ration book?" Prosecuting Counsel: "I have never seen one." The Judge: "Neither have I." —*Central Criminal Court.*
- The black market hardly exists in this country. Pilfering and dockside thefts helped to swell it, but on the whole there were few black market transactions.—*Col. Llewellin, Minister of Food.*
- Dehydrated products will disappear after the war, according to U.S. food producers, quoted by B.U.P. from Chicago, and frozen meat products, wrapped in Cellophane and marked with their grade and weight will increase.—*"The Star."*
- As Eire is the only country in home waters likely to send us food for years to come, why quarrel with our bread and butter? The two islands are so essential and complementary. —*Seymour Leslie in a letter to "The Times."*
- I have just finished a very inadequate meal at the cost of sixpence, consisting of a piece of fish fried in batter, nett weight 1¼ oz., price 4d., and eight chips, which cost me 2d. Yes, I counted the chips.—*Letter to "The Yorkshire Evening Post."*
- There is the dangerous school composed of vested interests and ignoramuses, who, for personal gain or lack of interest, would as soon consume frozen meat and canned food as lift a finger in the defence of a prosperous countryside.—*Mr. Maxwell Howard.*
- I am not prepared to have this island cut below its minimum safety reserves of food and oil, except in cases where sure and speedy replacement can be made. Subject to this, we shall do everything in our power to help the liberated countries.—*The Prime Minister.*

New Director

The directors of Edgar Allen and Co., Ltd., announce that they have elected Mr. William H. Higginbotham as Chairman of the Board of Directors of the company, in succession to the late Mr. C. K. Everitt, whose death occurred recently.

Mr. Higginbotham, who is a Lancastrian by birth and an Incorporated Accountant, joined the company in 1930 as secretary (a position which he now relinquishes) and became a director in 1933. He has since been in charge of the financial side of the company's activities.

* * *

Chemists Improve Canteen Menus

The vitamin C content of vegetables at different seasons and its retention during cooking are some of the subjects of a survey carried out over a lengthy period at the food laboratory of Messrs. Barkers (Contractors), Ltd., in the Morris Motors Works at Cowley. This laboratory is the firm's headquarters for research into the problems of cooking, preserving and serving foods with the greatest possible conservation of their nutritional content. The department also advises on the planning of meals which are palatable and satisfying, while supplying the proper amounts of all the vital food factors.

Samples of complete meals are taken from the actual dishes being served in canteens. A portion of toad-in-the-hole or a joint, complete with the vegetables and sweet dish, for example, is scooped up and placed in a hermetically sealed jar and taken to the laboratory, where it is analysed. Similar tests of all meals served over a period are made and carefully logged so that the chemist-in-charge may submit a report, quoting the actual vitamin content as compared with the desired standard, and recommend methods of changing menus to compensate where necessary.

Smithfield Institute

A Roll is being prepared of Old Students who are or have been serving with His Majesty's Forces. The names, addresses and details of such students would be greatly appreciated and should be sent to Mr. F. Gerrard at Smithfield Institute, Eagle Court, St. John's Lane, Clerkenwell, London, E.C.1.

* * *

A New Empire Product

Prior to the war, Japan produced from about 2 million to 4 million pounds of agar-agar and Britain imported about 200 tons. Owing to the cessation of supplies from Japan, intensive research has been carried out in New Zealand and Australia in connection with the utilisation of species of seaweed closely allied to that from which the Japanese agar-agar is made.

New Zealand agar-agar is now obtainable in this country. Davis Gelatine, Ltd., inform us that the Direction recently made under Article 1 of the Control of Agar (No. 1) Order, 1943, authorises them to supply Davis Standard Agar for experimental purposes in quantities not exceeding 2 oz. to any one customer.

Its distribution in this country will be undertaken by the Davis Company, and although for the present the use of agar-agar is restricted to bacteriological and medicinal purposes, they are at liberty to allow all users to have samples for test and comparison. For a period the quantity of the product available for use in this country is likely to be small, but there is a limited stock in hand, and during the next nine months it is anticipated that several tons will be received from New Zealand.

The product is in granulated form—approximately 30 mesh—and when hot gives a clear sparkling water-white solution which sets to an opalescent gel far stronger than those formed at the same concentration either by the Japanese or American variety. In fact, it has been found that 7 parts of Davis Standard Agar are equivalent to 9 parts of American and to 10 parts of the best quality Japanese agar-agar.

Nutrition Society

The Nutrition Society is organising a discussion on "The Nutritional Factors Affecting Wound Healing," to take place on Saturday, May 26, at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 1.

* * *

New Appointment

Mr. S. E. Collingwood, who has been associated with James Pascall, Ltd., for fifteen years as sales manager, has been appointed a director of the company.

* * *

Productive Farms

"We shall have to produce more food at home; our farm land will have to be kept bountifully productive," declared Sir Miles Thomas, Vice-Chairman of the Nuffield Organisation, in a speech to Banbury Rotary Club recently.

The theme of Sir Miles' speech was the benefit that will accrue to the provinces through the more even distribution of industry in the post-war years. This spreading of industrial activity to the rural areas of Britain was a development which has been hastened by the war; indeed, the urgent need for attaining maximum production had taught us many lessons which should apply with advantage and benefit to our people in the years of peace to come.

"In the field of agriculture, we shall get off to a fine start," said Sir Miles, "because never has the countryside of Britain been in better fettle than it is to-day.

"The added emphasis on agricultural pursuits in the coming peace is going to mean not merely a better spread of wage-earning capacity throughout the countryside, but it is also going to mean the revitalisation of the old English market town, which will become a centre for the sale and service of agricultural machinery—much of it of the new, modern mechanised type—and there will be a re-awakening of the manifold activities that quite rightly used to take place in these centres where the communal interests of a busy countryside were focused."

* * *

Peach Canning at Lynn

Peaches, brought from America, are being canned by Beaulahs (King's Lynn), Ltd., for the troops in the Pacific war zone.

The peaches arrive in large tins, the syrup is drained off and the peaches are re-packed into smaller tins and weighed. Syrup, brought up to a much higher standard, is added. The cans are then processed and coated with a special lacquer capable of withstanding the extreme climatic conditions of the Pacific war zone. Finally, they are despatched to a central packing depot and incorporated into a six-men "Compo" pack—a complete ration to last six men twenty-four hours.

A Change in Gas Advertising

In January last a new governing body for the Gas Industry came into being through the merging of the executive committees of two gas organisations, the National Gas Council and the British Commercial Gas Association. The newly formed British Gas Council, under the chairmanship of Mr. A. E. Sylvester, F.C.A., Managing Director of the Gas Light and Coke Company, became the representative organisation for the whole industry on matters of national interest, policy and commercial development.

One of the results of this important step in the reorganisation of the Gas Industry will be the disappearance from the advertising columns of the press of a name that has become increasingly well known during the last thirty-four years. Gas advertisements will no longer bear the imprint of the British Commercial Gas Association, but that of the British Gas Council.

* * *

Food Education Society

The Society regrets that the Government has reduced the extraction of wheat grain from 85 per cent to 80 per cent. on inadequate scientific and clinical data, especially at a time when the food supply in general is so uncertain.

There is good reason to think that any reduction below 80 per cent would be detrimental to the health of the people and should not be put into effect without further enquiry and experience.

The Society is strongly of opinion that a specification of the post-war loaf is highly desirable, as in the case of other basic foods.

The above statement has been circulated to the appropriate Government Departments and to the Press.

The following Resolution has been sent to the Minister of Education: "The Council of this Society would ask the Minister of Education to ensure an important place to the training in elementary food science and nutrition in the curricula of girls and boys in the new education scheme."

The following publications will be ready shortly: *Food Education —Principles and Practice*, by Lord Horder, G.C.V.O., M.D., Presidential Address to the Society, June, 1944, price 4d. post free (Members); *Food and Dental Diseases*, Lecture by Sir Norman Bennett, M.A., M.B., L.D.S., price 7d. post free (Members).

* * *

Society of Chemical Industry

The Annual General Meeting of the London Section will be held in the Rooms of the Chemical Society, Burlington House, London, W. 1, at 2.15 p.m. on Monday, May 7, 1945, prior to the delivery of the paper by Mr. S. Barratt, B.A. The Report for the year ended December 31, 1944, will be considered, and members will be elected to fill the vacancies on the Committee.

* * *

Mr. H. E. Howard

Mr. H. E. Howard, previously with Marber and Co. (Food Products), Ltd., has joined the staff of Atomised Food Products, Ltd., of Welwyn Garden City, Herts., the manufacturers of Viteem soups and Delicaf coffee. Mr. Howard will be in charge of the sales organisation of this company.

* * *

Scottish Bacon Curers

The reconstitution of the Bacon Marketing Board, with additional powers enabling it to represent the industry in post-war policy matters, was referred to in the report for the past year, which was approved at the twelfth annual meeting in Glasgow of the Association of Scottish Bacon Curers.

When war broke out, the report stated, the Board ceased to function and such powers as were necessary to preserve its interests under war conditions were vested in a small executive. In view of the progress of the war in Europe, however, it became essential that there should be an organisation capable of representing the bacon curers, and the reconstituted Board was already closely engaged in the examination of post-war problems. Mr. T. Gilliland has resigned from the Board, and his place has been taken by Mr. F. D. Lawson, Aberdeenshire. Satisfaction was expressed in the report at the smoothness with which the recently inaugurated joint industrial council for the industry is operating. Mr. J. Kilpatrick, Thornhill, was re-elected president, with Mr. R. Turnbull, Bridge of Allan, vice-president.

* * *

British Caterers to Visit U.S.A.

With the support of the Ministry of Food and the U.S. War Food Administration, a delegation from the National Society of Caterers to Industry is expected shortly to visit the United States to study various aspects of industrial and other forms of large-scale catering there.

Mr. Harold Gardner, managing director of John Gardner (London), Ltd., and Chairman of the Society, will lead the delegation, which will also include Mr. Kenneth Hall, managing director of K. and A. Hall (Caterers), Ltd., London, Vice-Chairman of the Society; Mr. J. B. Freebairn, managing director of Northern Caterers, Ltd., Huddersfield; Mr. T. L. Porter, managing director of Liverpool City Caterers, Ltd., Liverpool; Councillor Harry Sharp, managing director of Smallmans, Ltd., Manchester; Mr. F. C. Swinnerton, managing director of Swinnertons (Industrial Canteens), Ltd., Stoke-on-Trent; Mr. Arthur Lawson, Secretary of the Society and member of the Industrial and Staff Canteen Undertakings Wages Board.

Among other centres, the delegation expects to visit New York, Washington, Chicago, Detroit, Los Angeles, San Francisco, Philadelphia and Boston.

Arrangements are being made for the delegation by the U.S. War Food Administration, other U.S. Government agencies, the American catering trade associations, leading catering firms and industrial organisations concerned with the feeding of war workers.

In addition to visiting works and staff canteens in all the principal industries, the delegation intends to make a special study of hospital and school feeding and of technical training and nutritional research facilities in the U.S.

British Standards Institution

The Right Hon. Lord Woolton was recently elected President of the British Standards Institution. Speaking at a luncheon given by the Institution, Lord Woolton, in referring to the establishment of the British Standards Institution in 1901 by the engineering industry, said that no one could question that in recognising the value of standardisation the British engineering industry had been able to lead the world in the production of munitions.

Standardisation was one of the basic problems of efficient production; it ensured the maximum value per unit of price; it gave the consumer protection by guaranteeing a standard of quality or performance. He felt it was necessary to see that the public were aware that goods made to a British standard meant value for money. In war we had seen the advantages of standards; let us apply the lesson we had learnt from war to the needs of peace. He looked forward to the time when the common law caveat "let the buyer beware" no longer applied. The world, at the present time, was bare of goods; it was going to be a sellers' market, and he hoped that British industries would maintain their high standard.

* * *

Industry—The Battle for Control

A new basis for Anglo-American industrial co-operation was called for by Mr. R. S. Sanderson, a Scottish woollen manufacturer, at a meeting held at the Royal Empire Society, London, on March 19.

Representatives of seventy industries and of all sections of the trade Press met to consider the application to industry of the new book *Ideas Have Legs*, by Peter Howard, in which is set out his conception of industry and its part in the post-war world. "In this book," Mr. Sanderson said, "we have the manufacturing particulars for a pattern of a world that works. It is a programme in which our American allies will be glad to join us. Mr. Truman, Vice-President of the United States, who has great experience of American industry, has said: 'What Americans really want is not a promise of getting something for nothing, but a chance to give everything for something great.' It seems to me," said Mr. Sanderson, "that goes for Britain as well as for America."

Alderman A. A. Rignall, a London steelworker, told how the construction of the Mulberry harbours was almost held up, but was saved by a miracle of teamwork. "According to Mr. Bevin," said Alderman Rignall, "those harbours saved 150,000 Allied lives. Yet when the management asked the men to cut meal-times and stagger shifts to get the steel spud-columns made in time, there had been an attempt by an influential extremist section to see that co-operation was only given on their terms. The meeting was swinging that way. Then men trained in industrial teamwork stepped in. They appealed to their fellow-workers to put the country before cash. After a stormy meeting a vote was taken. It was overwhelmingly for full and unconditional co-operation."

"British labour will follow a sound lead," Alderman Rignall added; "the real battle line in industry is not between management and labour, but between the constructive elements in both on the one side and the selfish forces of division on the other."

Captain R. M. D. Palmer, director of George Borwick and Co., Ltd., and Mr. Lionel Exton, director, the Exton Hotels Co., Ltd., were among the sponsors of the meeting.

* * *

Change of Name

Birmingham Electric Furnaces, Ltd., of Tyburn Road, Erdington, Birmingham, inform us that they have decided to change their name to Birlec, Ltd. Their trade mark "Birlec" has been established for many years, and it is felt they are already more widely known by this shortened title.

The company, a subsidiary of the Mond Nickel Co., has pioneered all types of industrial electric heat treatment and melting furnaces in this country, and, in addition, manufactures specially designed gas furnaces, induction heating apparatus and drying equipment.

Policy, management and personnel will not be in any way affected by the change.

Music in Industry

We have received a well-produced booklet entitled *A Second Treatise on Music in Industry*, by Edgar Jackson, in which is included a memorandum on equipping the factory for sound, issued by Dictograph Telephones, Ltd. This is a revision of the original treatise published in May, 1942, and it is brought up to date by the incorporation of further knowledge discovered during considerable additional association with the subject. The publishers offer it with the hope that it will act as a useful guide to the many employers who have installed, or may instal, in their factories and workshops apparatus for broadcasting to their workers *en masse* the B.B.C.'s "Music While You Work" programmes and those arranged by themselves by means of gramophone records.

There is little about the use of music in industry, its advantages, and technique of presentation, that is not contained in the booklet. It is enlivened on almost every page by humorous cartoons and combines instruction with amusement.

* * *

Carton-making Machines

We are advised by the British Milk Carton Co., Ltd., of Cardiff that their new prototype carton-making machines will be finished about August or September this year, and that they hope to be able to effect delivery of these machines from January, 1946.

This carton, primarily designed as a liquid milk package, can be used for other liquids and powders, and is unique by the fact that it is made from an *unwaxed* white waterproof paper. The carton is not mass-produced at a central factory and then distributed, but the machines themselves are sold, enabling the buyer to package his goods where they are produced—in his factory. On acquiring a set of machines the output is subject to a small royalty. The carton is cylindrical in shape and is capped and sealed with paper, so that the whole package is paper.

The machines, five in number, produce cartons from a roll of paper in three sizes—pint, half-pint and third-pint—at the rate

of 2,000 per hour, and caps and seals at the same rate. The changeover from one size to another takes a competent operator about twenty minutes.

The carton as a milk package was successfully used in Cardiff for about two years prior to the war, the machines to produce it having been imported from the Continent. The British-built machines will be superior in every way, having been re-designed in the light of experience gained on the imported machines, which have been running throughout the war period on a limited paper allocation.

With paper supplies available at something like a normal figure, the carton will be a most economical post-war package, and the company expects a big demand for the machines.

The original machine can be seen by appointment at any time, and the company will be pleased to forward samples on request.

* * *

Service to Science

Number 11 of the periodical review of new ideas and apparatus published by Townson and Mercer, Ltd., consists of a reprint of a lecture delivered to the Society of Chemical Industry by L. T. Townson and R. Barrington Brock, Governing Director and Director of Townson and Mercer, Ltd. This lecture was entitled "The Practical Side of Fine Temperature Control," and included descriptions of items of unusual research and control apparatus supplied by the firm. It should be of considerable interest to all analysts.

* * *

Better Boiler Plant Maintenance

A good range of books dealing with the various aspects of boiler plant operation can usually be found in technical libraries and bookshops, but, surprisingly enough, it has not been possible to find much information in a concise form which could be used by managing executives, maintenance engineers and boiler attendants as a reliable guide to the practical side of boiler plant maintenance.

No doubt this lack of guidance had something to do with the poor state of much industrial boiler plant. The Ministry of Fuel and Power has stated that the close scrutiny which steam generation and boiler plant performance have been given on a national scale under war conditions has shown the extent to which maintenance of plant had been neglected. "In many instances," they point out, "the condition of the boiler plant was found to be such that efficient operation was impossible, the most elementary principles of boiler maintenance having been ignored."

A little booklet, Fuel Efficiency Bulletin No. 38 (*The Maintenance of Industrial Boiler Plant*), has just been issued which is in the nature of a quick reference to the maintenance of industrial boiler plant. The booklet is the most recent of the Fuel Efficiency Bulletins issued by the Ministry of Fuel and Power, and may be obtained from the Secretary of any of the Regional Fuel Efficiency Committees.

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Society of Public Analysts

The Annual General Meeting, held on Friday, March 9, 1945, with the President, Mr. S. Ernest Melling, F.R.I.C., in the chair, marked the seventieth anniversary of the Society. In the past year the usual activities of the Society had been maintained, the financial position remained very satisfactory, the membership had increased by 117 to 1,197, and the circulation of the Society's journal, *The Analyst*, in spite of paper restriction, had increased. There had also been important developments. In pursuance of the policy decided upon a year ago, the Society had formed, within the framework of its constitution, two groups concerned with particular branches of analysis—viz., the Microchemistry Group (Chairman, Professor H. V. A. Briscoe; Hon. Secretary, Mr. R. Belcher; present membership, 143) and the Physical Methods Group (Chairman, Mr. R. C. Chirnside; Hon. Secretary, Dr. F. Wokes; present membership, 115). These groups will hold meetings from time to time in London and elsewhere.

The proceedings terminated with the Presidential Address of the retiring President, Mr. Melling, who, after reviewing some of the outstanding events of the past year in the Society's affairs, made some observations on the subject of water and water supplies. The address will be published in *The Analyst*.

The Officers and Council elected for the forthcoming year are as follows:

President—G. W. Monier-Williams, O.B.E., M.C., M.A., Ph.D., F.R.I.C.

Past Presidents serving on the Council—F. W. F. Arnaud, Bernard Dyer, John Evans, Edward Hinks, E. B. Hughes, G. Roche Lynch, S. Ernest Melling, W. H. Roberts.

Vice-Presidents—B. G. McLellan, J. R. Nicholls, B. Voelcker, and, *ex officio*, H. M. Mason (Chairman, North of England Section) and J. B. McKean (Chairman, Scottish Section).

Hon. Treasurer—George Taylor.

Hon. Secretary—Lewis Eynon.

Other Members of Council—A. L. Bacharach, C. A. Bassett, H. Childs, R. C. Chirnside, A. A. D. Comrie, S. Dixon, W. F. Elvidge, J. H. Hamence, D. W. Kent-Jones, (Mrs.) J. W. Matthews, Andrew More, G. H. Walker, and, *ex officio*, Arnold Lees (Hon. Secretary, North of England Section) and R. S. Watson (Hon. Secretary, Scottish Section).

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Mr. Anton Jurgens

The death is announced at Torquay of Mr. Anton Jurgens, who, in 1929, played a leading part, with the late Sir Francis d'Arcy Cooper, in forming Unilever, an amalgamation of the Margarine Union, formed in 1927, and Lever Bros., Ltd.

Mr. Jurgens was a pioneer in the production of margarine. He was in his early twenties when his father, head of a Dutch firm of butter merchants at Oss, died. The process of margarine was then attracting the attention of dairymen, and when the son took over the business he developed the manufacture of what was then a novel commodity. The family business expanded into a vast organisation. Offices were opened in this country in 1912 for the marketing of margarine, which was then imported. Six years later the first Jurgens factory in Britain was opened at Purfleet.

News from the Ministries

Canned Vegetables

The Minister of Food has made an Order, S.R. & O. No. 284 of 1945, which came into force on March 18, amending the Canned Fruit and Vegetables Order by adding maximum prices for canned beetroot, carrots, celery, parsnips and turnips.

Supplies of the varieties named are not large and there will only be a limited distribution in certain areas.

* * *

Standards for Mineral Waters

The Minister of Food has made an Order amending the Soft Drinks Order, 1943, so as to increase slightly the sugar content and to reduce correspondingly the saccharin content of standard unconcentrated soft drinks. The change will have the effect of improving the quality of unconcentrated soft drinks. It will require only a negligible addition to the total quantity of sugar allocated to the industry. This amendment took effect on April 1, 1945, but stocks of soft drinks complying with the former standard may be sold by the manufacturers up to May 1 and by other persons up to July 1, 1945.

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Major J. Russell Gales

Major J. Russell Gales resigned his appointment as Divisional Food Officer for the Southern Division as from March 31, 1945, after which date he returned to his pre-war business.

Major Gales has served under the Ministry of Food since the outbreak of war and as Divisional Food Officer in the Southern Division since March, 1941.

The Minister wishes to place on record his appreciation of the valuable services Major Gales has rendered to the Ministry.

He has been succeeded as Divisional Food Officer, Southern Division, by Mr. A. S. Foskett, who, after service as a member of the London Port Area Grain Committee, joined the Ministry's staff in May, 1943, working in Algiers. He was later transferred to the staff of the India Office and served in India for six months in 1944.

Ministry of Food—Bakery Division

Following the resignation of Mr. W. S. Duthie, O.B.E., from his post as Director of Emergency Bread Supplies at the Ministry of Food to take up his new appointment with U.N.R.R.A. in the Balkans Mission, the Emergency Bread Supplies organisation is being incorporated in the Bakery Division under Mr. J. N. Frears. Mr. A. E. C. Whatton, Assistant Director to Mr. Duthie, resigned at the end of March.

* * *

Bread (Control and Maximum Prices) (No. 2) Order

The Ministry of Food has made an Order amending the Bread (Control and Maximum Prices) (No. 2) Order, 1943, in three minor ways. The permitted proportion of imported flour for batch bread in Scotland is reduced to 12½ per cent. in conformity with the provisions of the Flour Order, 1945. The definition of "Vienna Loaf" is deleted and breads having a minimum protein content of 20 per cent. are exempted from all provisions of the Order other than licensing.

This Order came into force on March 25.

* * *

Labelling of Pre-Packed Ice Cream

The Ministry of Food proposes to exempt manufacturers of prepacked ice cream from the requirements of Article 2(iii) of the Labelling of Food No. 2 Order so that, for the rest of this year, the ingredients of pre-packed ice cream need not be specified on the label. This concession is due to the difficulty of complying with the Order in the present supply position, and has been made without prejudice to the general question of the desirability of either fixing a standard for ice cream or requiring a statement of ingredients on the label.

It has also been decided that the declaration of minimum quantity should be made in fluid ounces.

Mr. J. N. Walker

Mr. J. N. Walker, Deputy Director of Cold Storage, found it necessary to relinquish his appointment on March 31, 1945. The Minister regretfully accepted his resignation and expressed his appreciation of Mr. Walker's services to the Ministry.

As from April 1, 1945, Mr. J. A. Robertson, Area Cold Storage Officer for the Midland Area, has been appointed Deputy Director of Cold Storage in succession to Mr. Walker.

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Maximum Retail Price of Oatmeal

The Ministry of Food wishes to remind those oatmeal millers who are offering oatmeal for sale at the maximum retail price, that an additional charge for postal rates or transport by rail is prohibited under the Oat Products (Control and Maximum Prices) Order, S.R. & O. No. 5 of 1945.

The maximum retail price already allows for such extra charges.

* * *

Flour Confectionery Control

The Ministry of Food have made an Order amending the Flour Confectionery Control and Maximum Prices Order, so that on and after March 19 producers may make additions to cakes after baking. A maximum fat and sugar content is no longer prescribed, but the maximum price provisions of the Order remain unchanged. There will be no increase in the allocation of ingredients.

* * *

Mission to France

Members of the Wine and Spirit Association have left for France to make arrangements for the possible purchase and shipment of French wines and brandy. The mission has the approval of the Ministry of Food.

Overseas Items

New Method of Butter Making

A new way of making butter without churning probably will gain wide use after the war, Dr. E. G. Hood, dairy research chief of the Canadian Department of Agriculture, stated recently.

Butter manufactured by this process, which is an application of the centrifugal principle used in cream separation, is reported to have perfect body, texture and normal colour.—*Reuter.*

* * *

New Zealand Canning Industry

How the war more than doubled the demand on the New Zealand fruit and vegetable canning industry—from a total production valued at £362,192 in 1938-39 to £1,259,271 in 1942-43—was disclosed at the formation meeting of the New Zealand Fruit and Vegetable Canners' Federation in Wellington. War-time canning of locally-grown green peas, for instance, reaches figures well in excess of normal civilian demand. The greatest bulk of the industry's production during the last five years has been shipped to New Zealand and Allied forces overseas.

* * *

Controlling Freezer Burn

Dehydration or "freezer burn" of meats can be controlled by designing the air circulating system with a view to decreasing the moisture-carrying capacity of the air, according to Earl D. Pollock, export manager, Vilter Mfg. Co., Milwaukee, Wis., in a talk before the American Society of Refrigerating Engineers.

In a freezer circulating 2,000 lb. of air per minute at 35° F., for the freezing of 1,000 lb. of product per hour, he declared the maximum possible moisture pick-up would be 5 lb. per hour. This would be equivalent to a dehydration loss of 0·5 per cent. In practice the actual loss would be considerably lower, as moisture would be readily available from other sources so that all of the moisture gain in the air stream would not come from the product.

New Fast Freezer

A new fast freezer which delivers 6,000 lb. of fresh produce an hour is now at work in the food processing plant of John S. Isaac and Sons at Ellendale, Del., U.S.A., and will be used to quick-freeze annually more than a million and a half pounds of lima beans alone in this centre of U.S. lima bean production.

One of the unique features of the new freezer is its rapid defrosting equipment, which permits a minimum of production interruption and immediate resumption of peak production the instant frost is removed from the cooling coils. The design also makes it possible to incorporate two or more machines into a single unit to conform to individual plant layouts. Two freezers can be operated side by side to provide a parallel production line for freezing both loose and packaged products at the same time.

* * *

Wood for Fodder Yeast

Research in transforming wood into fodder yeasts supplying protein for farm animals is reported to the American Chemical Society by three scientists of the U.S. Forest Products Laboratory at Madison, Wisconsin. Wood can be hydrolised into sugars by treatment with sulphuric acid, and this sugar in turn can be fermented into industrial alcohol or yeast.

It is reported that, on a cost basis, it is doubtful whether yeast protein from wood can as yet be produced at a price in the same range as low-cost protein from such crops as soya beans. This work was part of experiments to determine the best conditions for producing wood sugars from many types of wood, and to evaluate them as sources of ethyl alcohol and fodder yeast. Hydrolysates from spruce and southern yellow pine gave good fermentations, but those from Douglas fir were difficult to ferment. Wood sugar from maple, yellow birch, and beech gave results equal to those from the best softwoods.—*Reuter's Trade Service.*

Livestock By-Products in the U.S.A.

United States meat packers are sponsoring an ambitious programme to develop the extraction of by-products from livestock. Many of the major companies are financing this work in their own laboratories or in independent research institutes or universities.

Among the materials which are being obtained are pharmaceuticals, food flavour improvers, materials for the plastics industry and scores of other by-products.

Armour and Company's research laboratory in Chicago has developed a substitute for human blood to be used in transfusion cases. This company's laboratory at Fort Worth has produced sera for many diseases, including scarlet fever and measles.

In the laboratories of the Swift Company research of national scope is being sponsored, and the directors this year made their second grant of 200,000 dollars for university fellowships relating to broad agricultural problems. Swift's laboratories some years ago discovered in the course of research on shortenings certain monoglycerides (simple fatty compounds) which produce better results in bakery when added to the products.

Through a development by Wilson and Company, animal hair is washed, curled and dried, and then used in air filters for furnaces, in tractors and automobiles. It is also in increasing use in soundproofing.

An example of the new materials which have been developed as a result of research into the production of chemicals from animal fats is nitrile. This substance is produced by the reaction of fatty acid with ammonia and is useful as a rubber plasticiser, in the making of synthetic rubber and as an insect repellent and insecticide. By hydrogenating nitrile, chemists are able to obtain another insecticide called vermicide, or by the fats only a partial treatment with ammonia a chemical can be obtained which is used as a water repellent by the textile trade.—*Reuter's Trade Service.*

Sierra Leone Ginger Prices

The price payable for the 1945 Sierra Leone ginger crop will be the same as that paid for the 1944 crop—*i.e.*, £40 per ton naked ex scale port of shipment.

* * *

Secondary Foods in Queensland

Since the outbreak of war Queensland has been providing for both the Services and civilians a number of foodstuffs in which new processing methods are conspicuous. Nearly 20,000 workers have been engaged in these industries, producing last year a value of over £40,000,000. Among the chief activities in this connexion to-day are the canning of jam, fruits, vegetables, meat canning and packing, the processing of dairy products, and the production of beverages, confectionery, pickles, sauces, and sundry packaged grocery lines.

Queensland factories putting up jam, fruit and vegetables are heavy producers, the principal products in 1943 being canned pineapple (19,600,000 lb.), jams (8,700,000 lb.), and canned fruit salad (3,600,000 lb.). The expansion of vegetable canning was somewhat delayed by a lack of equipment, so that production at first was confined to beans and cabbage. However, there has been further substantial expansion during the past nineteen months.

The production of canned meats in Queensland has been exceptional, running as high as 91,200,000 lb. or 67 per cent. of the total Australian output of this commodity. A number of factories, which are distributed throughout the State, are putting up meats, some of the main centres being Brisbane, Rockhampton, Gladstone and Townsville. Processing of dairy products has been chiefly restricted to cheese and ice cream; the principal centres are Brisbane in the south and Rockhampton in Central Queensland.

Confectionery benefits from the availability of domestic sugar, but factories are concentrated in the southern part of the State in the cities of Brisbane, Ipswich and Toowoomba. The total annual quantity of confectionery produced runs to about 500,000 lb. Pickles and sauces annually produced amount to about 5,000,000 quarts, while sundry lines include 95,500 cwt. of self-raising flour, 1,000,000 lb. of jelly crystals, 295,000 lb. of custard powder, 118,000 lb. of coffee powder, 170,000 lb. of baking powder, 73,000 gallons of vinegar, and 511,000 lb. of icing sugar.

So far there are no permanent dehydration plants in Queensland, and somewhat limited facilities for the canning of vegetables. Owing to climatic conditions vegetables are not extensively grown, so that no one area might be able to supply such a surplus of vegetables as to justify permanent canning or dehydration.

Publicity has, however, been recently given to the proposed establishment of a vegetable dehydration plant at or near Townsville, and to the possibility of creating mobile dehydration and canning units to take care of temporary surpluses in the principal agricultural areas. A co-operative society has recently established quite an important dehydration factory at Winton, the first of its kind in the State.

Dehydration has been applied to butter, the Queensland Butter Board operating a factory at Hamilton with a weekly capacity of 170 tons of finished "tropical spread." This product, a dehydrated butter with added antioxidants to prevent rancidity, has been earmarked for the Services. This is of some importance, since the estimated price of "tropical spread" for retail sale under peacetime methods of distribution would be from 3s. 6d. to 4s. per pound.

* * *

Commercial Conditions in the U.S.A.

The Review of Commercial Conditions in the United States of America is the first of a series covering twenty-six countries which is being prepared by the Department of Overseas Trade in collaboration with its overseas officers to assist firms with their post-war export plans. The reviews deal with commercial conditions in the various countries before the war, with particular reference to trade with the United Kingdom, war-time changes in their economy and external trade and the opportunities they offer for United Kingdom goods. They give, in fact, a straightforward account of developments in each market since the outbreak of the war, and they should therefore be of distinct value to exporters now engaged in the preparation of post-war plans.

The Review of Commercial Conditions in the U.S.A., together with four others dealing with Bolivia, Brazil, Chile and Peru, are now on sale at H.M. Stationery Office, York House, Kingsway, London, W.C. 2, and its provincial branches at 13A, Castle Street, Edinburgh, 2; 39-41, King Street, Manchester, 2; 1, St. Andrew's Crescent, Cardiff; and 80, Chichester Street, Belfast. They may also be obtained through any bookseller, price 6d. each, net.

* * *

Farming Machinery in Brazil

Since the restriction of imports of many products at the beginning of the war, the Brazilian Government has embarked on a programme to promote more widespread use of machinery in the country's agriculture. Its programme includes the purchase of tractors, ploughs, harrows, threshers and other implements which are loaned, sold or rented to farmers throughout the country at a minimum charge.

Farm machinery has been slow to gain a foothold in Brazil because the historically low prices paid for produce have made mechanisation difficult.

Farmers are now seeking, however, to offset the labour shortage by using agricultural machinery, although in this aim they have been hampered by a lack of fuel for operating the equipment.

Meanwhile, imports of farm machinery and apparatus have been greatly reduced. Domestic production has partially compensated for this shortage by supplying approximately 25 per cent. of the country's demand. Imports of farm equipment during 1942 (the last year for which figures may be published) dropped to less than one-fifth of the tonnage imported in 1938, the peak year.

Brazil's potential post-war market has been estimated at between 4,000 and 5,000 tons annually, with a valuation of between £400,000 and £500,000.—*Reuter's Trade Service.*

Information and Advice

Pâté de Foie Gras

9,823. *Required formula and method for making a pâté de foie gras from pork materials.* (Australia.)

The following materials are used:

130 lb.	Pork fat
45 ,,	Pig liver
9 ,,	Ham and rinds
9 ,,	Flour
18 ,,	Hot water
7 ,,	Onions
20	Eggs

Seasoning:

7 oz.	Pepper
7 ,,	Mixed spices
1¾ ,,	Nutmeg

The fat is immersed in water 95° C. for 4 minutes. The liver is used raw, hams and rinds are cooked and onions are used uncooked.

The materials are placed in the cutter in the following order: Ham, rinds, and onions, minced together, seasoning, hot water, flour, liver, eggs, then fat.

To prepare the liver it is sliced and put into a barrel with 1 lb. salt, 1 oz. saltpetre and 2 oz. sugar to 30 lb. liver. The materials are well mixed and left for 48 hours. The processing time for 3-lb. tins is 1 hour 40 minutes at 212° F., then 1 hour 20 minutes at 221° F.

Oxford Sausage

9,790. *Required sausage-making formulæ, especially "Oxford Sausage" taste. Also details of liquid meat smoke, and meat tenderiser.* (India.)

War standards control formulae for Oxford Sausage at the present time are:

Beef sausage—37½ per cent. meat, 7½ per cent. soya.
Pork sausage—50 per cent. meat. Meat content to consist of at least 90 per cent. pork. The tolerance for pork sausage is minus 2½ per cent. and plus 5 per cent.

The following spice recipe will be found satisfactory for an Oxford beef sausage, using a little over ½ oz. of the seasoning per lb. of sausage meat:

18 lb.	fine salt
4 lb.	ground white pepper
7 lb.	ground cayenne
6 oz.	ground nutmeg
6 oz.	ground ginger

With regard to "Liquid Smoke," one type is intended for painting on the skin of sausage, etc., and a powdered form for use with the seasoning. These substances are difficult to obtain at the present time. (Names of possible suppliers were given.)

The mechanical form of meat tenderiser, probably the best model, is one which breaks down the fibres by penetration by a series of fine metal probes.

Many chemical substances have been suggested at various times, most of them depending upon the presence of dilute acid to accelerate the change from collagen to gelatin on cooking. Lemon juice plus olive oil is sometimes used for steaks. A preparation of papain has also been used.

Information Supplied

9,835. *Name and address of firm supplying fork lift trucks.* (Glos.)

9,836. *Names and addresses of manufacturers of cotton bags suitable for packing foodstuffs.* (Yorks.)

9,837. *Names and addresses of firms supplying vanillin powder, ice cream essence; and of manufacturers of coffee grinding machinery.* (Irak.)

9,842. *Information regarding registering of a trade mark.* (Sussex.)

9,846. *Information regarding dehydrated fruit powders.* (Lancs.)

9,852. *Information regarding the preparation of cereals for breakfast foods.* (Staffs.)

9,854. *Information regarding the methods of determining the solubility of the protein of dried egg.* (Lancs.)

9,859. *Names and addresses of firms manufacturing screw-top tins.* (Sussex.)

9,870. *Information regarding the bottling of damsons and plums.* (Derby.)

9,871. *Name and address of firm supplying machines to code empty bags before packing.* (London.)

9,872. *Information regarding literature on brine alkalinity.* (London.)

9,880. *Information regarding thioglycolic acid.* (Cornwall.)

9,889. *Information regarding gravy salt.* (Eire.)

9,893. *Names and addresses of firms supplying upright labelling machines for fixing labels on glass jars.* (Lancs.)

9,894. *Names and addresses of suppliers of emulsifying agents used in reconstructing cream from butter and other fats in ice cream mixes.* (Staffs.)

9,898. *Information regarding the introducing of fat into hot mix ice cream.* (Staffs.)

9,899. *Details of the manufacture of glucose and solid dextrose from corn starch.* (Northumberland.)

9,900. *Information on training in bacteriology.* (Essex.)

9,910. *Name and address of firm supplying maw and dill seeds.* (Sussex.)

9,911. *Names and addresses of firms manufacturing powders in bulk packing suitable for making into drinks.* (Lancashire.)

9,912. *Formulae for pudding powders and Yorkshire pudding, lemon curd, junket mixtures, sauces and breakfast cereals.* (S. Rhodesia.)

9,922. *Information on war-time ice cream.* (Dorset.)

9,923. *Names and addresses of firms supplying vacuum filling machines for bottles and tins, labelling machines, cardbox making machines, tin box making machinery and stacking machines for stock rooms.* (Northumberland.)

Information Required

9,925. *A formula for making a substitute for citric and tartaric acids.* (Australia.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

565,620. CLEVELAND, F. J. (Coffee Products Corporation): Production of food extracts.
565,735. AUTOMATIC SCALE CO., LTD., and CRESSEY, R. G.: Automatic weighing apparatus.
565,828. NEWTON, A. J. E.: Device for removing seals from milk bottles and the like.
565,842. ROBINSON, LTD., E. S. and A., BEALE, W. H., and DUFTY, S.: Collapsible boxes formed of cardboard, pasteboard and the like.
565,928. PRATCHITT BROS., LTD., and PRATCHITT, W. M.: Machines for drying cereal grain or other granular materials.
565,943. ROBINSON, E. B.: Cardboard and like boxes or containers.
566,498. BAR, P. J.: Dehydrated potato product and method of making same.
566,580. KERVIN, W., and SULLIVAN, E. P.: Box for the packing and carriage of fish.
566,828. BURTON, W. G.: Production of dried potato.
566,856. TRITTON, S. M. L.: Manufacture of potato flour products.
566,879. FREEMAN, W. S.: Washing, drying, sterilising, and like plant, and to methods of using same.
566,979. CARDOX (GREAT BRITAIN), LTD.: Apparatus for utilising carbon dioxide for extinguishing fires.
566,976. STEVENSON, J. F.: Cover means for vegetables and other plants.
567,004. WALL AND SONS, LTD., T., and FOSTER, G. L.: Manufacture of canned sausages.
567,040. DURDIN, A. C.: Apparatus for straining liquids and comminating solids in a flow of liquid.
567,045. YUILL, W. M.: Method of and apparatus for packing or canning food and other plastic substances.
567,047. TRIGGS, W. W. (UNIVERSAL PAPER PRODUCTS CO.): Containers, and more particularly containers of the collapsible tube type.
567,059. BURGESS, A. F. (MARATHON PAPER MILLS CO.): Method of moulding and wrapping a block of plastic foodstuff.
567,095. HEYL, G. E.: Preparations for enhancing the growth and/or improving the quality of plants.
567,079. MORGAN, J. S., PICKERSGILL, W. A., and GAMMOON, J. C.: Conveyance of solids in liquids.

Abstracts of Recent Specifications

Improvements Relating to the Pasteurisation of Milk or other Liquids

This invention relates to the pasteurisation of milk or other liquids (hereinafter referred to as milk) by the High-Temperature Short-Time method.

In systems employing such method milk from the final heating section of the plant passes to a holding unit in which the milk remains for a short period of about 15 seconds. The milk from the holding unit passes to the cooling sections.

It is a requirement of the law that the milk passes from the holding unit to the cooling section by way of a flow diversion valve, temperature controlled means being provided whereby any sub-temperature milk is automatically by-passed out of the system.

It is an object of the present invention to provide an improved form of flow diversion valve or means which is of an open or exposed nature so that its operation may be observed while the plant is functioning and which permits of easy cleaning.

The flow diversion valve comprises a trough-like element into which the milk from the holding unit passes, such trough having outlet means by which the milk therein may be directed into distributing means for delivery to the cooling sections, or be diverted into a sub-temperature tank. The valve trough may be mounted upon trunnions or pivots to oscillate it for bringing the outlet into the appropriate position for normal delivery or diverted delivery of the milk.

As an alternative the valve trough may be fixed in position above a pivoted flap or baffle adapted to be adjusted to cause milk to flow in the appropriate path.

According to a modification the valve trough may be fixed and be provided with a pair of outlets located respectively for normal and diverted flow and controlled by a sliding or oscillating valve element.

561,604. Arthur Graham-Enock, Henry William Longville and Graham-Enock Manufacturing Company, Limited.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

FLAVABUT.—629,980. Flavourings for food (other than essential oils); flour, bread, biscuits (other than biscuits for animals), cakes, pastry, and confectionery (not medicated). **Commonwealth Products Ltd.**, 21, Abercromby Place, Edinburgh, Scotland; Manufacturers and Merchants.

CAFFY-O-LYONS'.—630,199. Coffee and coffee extract. **J. Lyons and Co., Ltd.**, Cadby Hall, Hammersmith Road, Kensington, London, W. 14; Caterers and Purveyors.

Correction.—In the April issue the name of **Walford and Company** was spelt wrongly. The paragraph should read:

PATELLA. — 628,183. Flavourings (other than essential oils), and flavourings partly of essential oils, the essential oils not predominating. **Walford and Company, Ltd.**, Heath Street, Newton Heath, Manchester, 10, Lancashire; Essence Distillers and Manufacturing chemists.

New Companies

H. C. Groom (Chester), Limited. (390113.) Belle Vue Farm, Guilden Sutton, Ches. To take over a bus. of a fruit grower, nurseryman and farmer carried on as "H. C. Groom and Co." at Guilden Sutton. Nom. cap.: £4,800 in £1 shares. Dirs.: H. C. Groom, Belle Vue Farm, Guilden Sutton, Ches.; F. F. Sandlin, 8, Green Lane, Vicars Cross, Ches.

G. Fisher (Wholesale), Limited. (390071.) 12, Broadway Chambers, W. 6. To carry on bus. of confectioners, chocolate manufacturers, tobacconists, etc. Nom. cap.: £1,000 in £1 shares. Dirs.: A. T. Gorman, 113, Greenway, Uxbridge, Middx; Mrs. W. Fisher, 7, Grange Parade, Uxbridge Road, Hayes.

Daniel and Dawe, Limited. (390275.) Commercial Road, Penryn, Cornwall. To take over bus. of a fruit and potato merchant carried on at Penryn as "F. Dawe and Son." Nom. cap.: £5,000 in £1 shares. Dirs.: H. Dawe and Catherine A. Dawe, both of The Cottage, Quay Hill, Penryn, Cornwall; W. J. Daniel, Tresco, New Street, Penryn, Cornwall.

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.